VII—I

JANUARY THIS ISSUE 184,000 10 CENTS

POPULAR MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT

PUBLISHED IN CHICAGO

LARGEST CIRCULATION OF ANY MECHANICAL PUBLICATION IN THE WORLD

NEW FIGHTING-TOP FOR U. S. BATTLESHIPS

The "Haystack" Fighting-Top Marks a Distinct Era—Other Nations Hasten to Adopt the Idea —Evolution of Mid-Air Conflict from Earliest Times to the Present Day

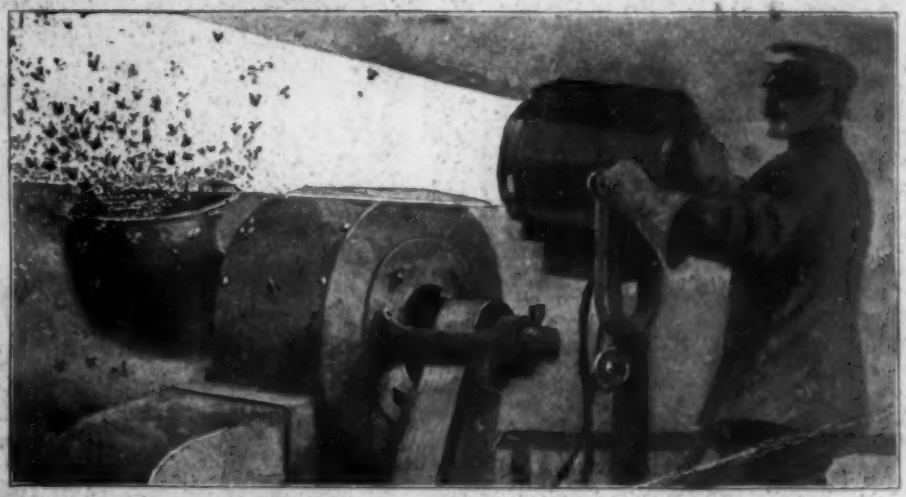
New Electric Locomotive has 4,000 Horsepower

Tin Can Clubs to Grow Forests

Typewriter Worked by Wireless Telegraph

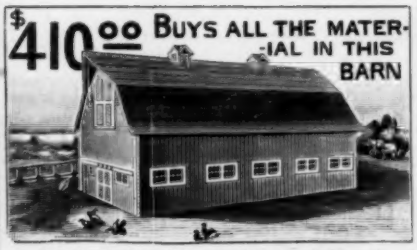
Automobile for Children

Machine Ties Bundles



Kills Three Tons of Moths in One Night—See Page 5

THIS MAGAZINE CAN BE PURCHASED FROM ANY NEWSDEALER IN THE UNITED STATES



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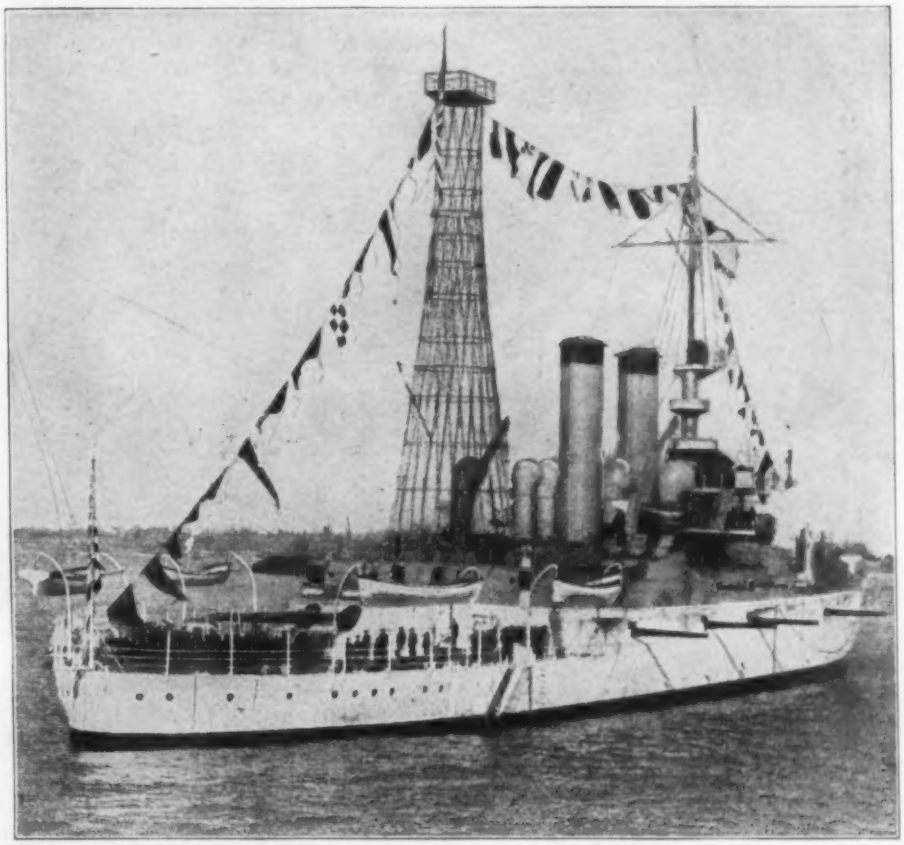
CHICAGO HOUSE WRECKING CO., 35th & Iron Streets, CHICAGO

POPULAR MECHANICS

Vol. 11. JANUARY, 1909. No. 1

THE NEW FIGHTING-TOP FOR U. S. BATTLESHIPS

Enemy's Shells May Pass Through, but Cannot Bring It Down



U. S. Battleship "Idaho" with Haystack Top

A fighting-top that shells cannot destroy has long been the desire of all naval powers, but it has remained for the United States to bring such an idea to a practical realization.

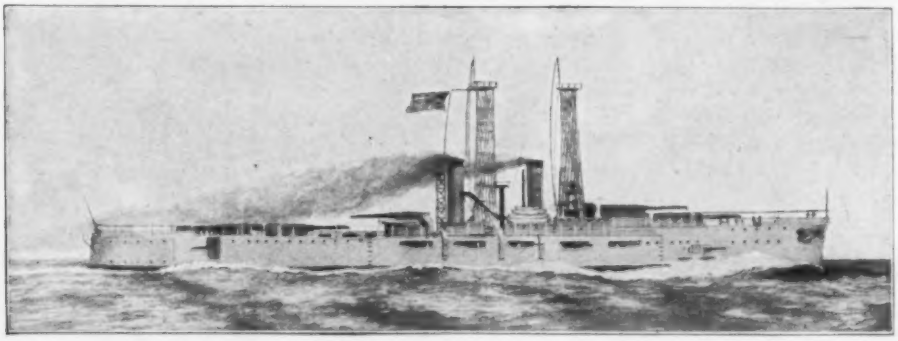
The photograph here shown is of the "Idaho," the first battleship to be so equipped, and its fighting-top is known as the "haystack." The drawing shows the "North Dakota" as she will look when completed. From the fact that both masts, or fighting-tops,

of the "North Dakota" are of the new construction, it is obvious that American naval experts believe the idea of remarkable worth.

The "haystack" is of steel construction and has an enormous advantage over its more solid predecessor, in that its build makes it almost impossible for it to be destroyed. An enemy's shells will pass through it without carrying enough of it away to bring it down.

It is claimed that the idea has greatly interested the British government and that its warships of the future will be similarly fitted.

Fighting-tops of one kind or another have been in existence since ancient



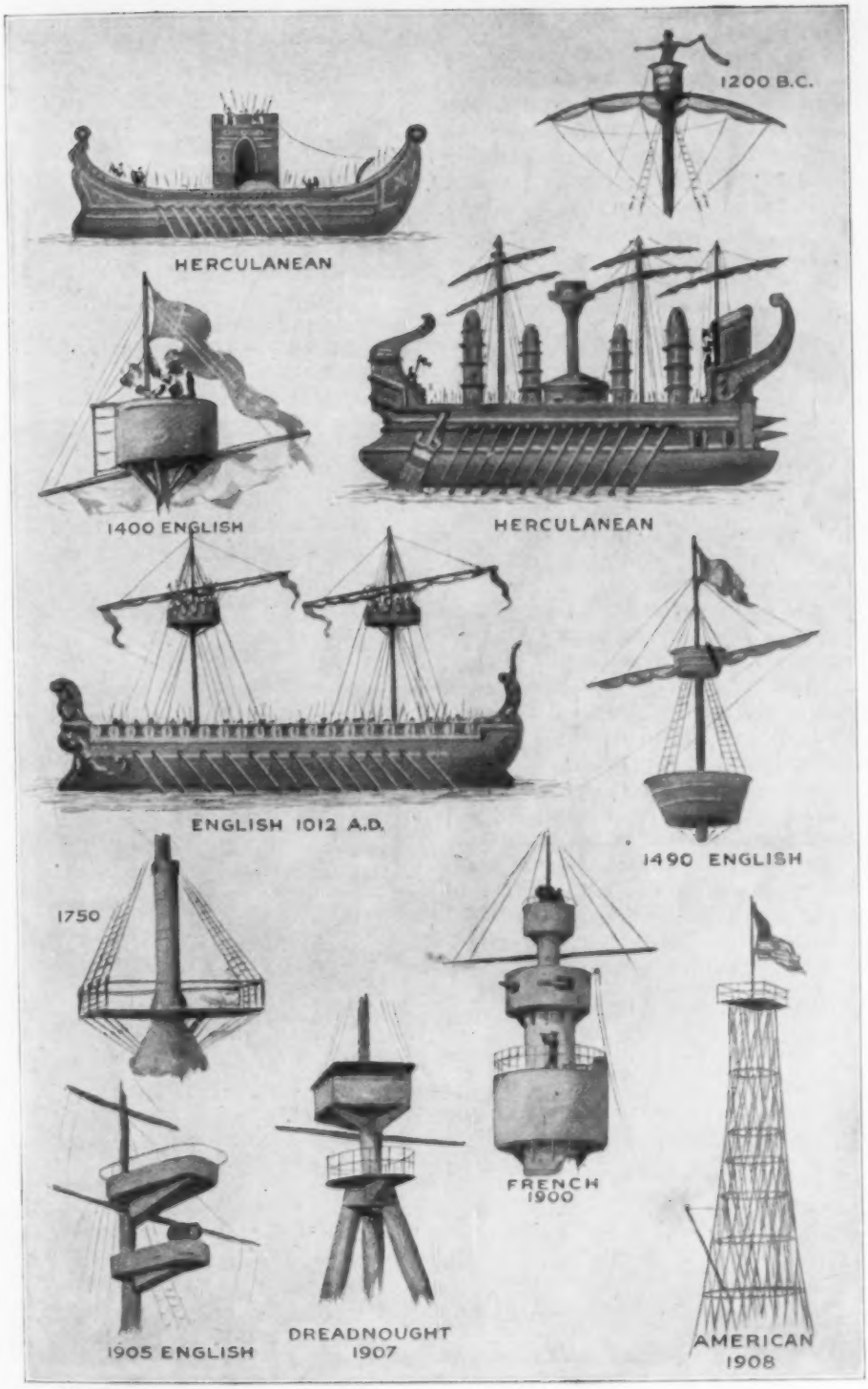
U. S. Battleship "North Dakota" as She Will Appear with Two "Haystacks"

nations started to wage war against each other on water as well as on land. In the set of illustrations accompanying this article is shown the evolution of the fighting-top from 1200 B. C. to the close of 1908. In this long stretch of a little more than 3,000 years the fighting-top has evolved through many stages until it is no longer an elevation from which archers fire their crossbows or guns belch forth shot and shell and men fight, but from which the range of the enemy is found for the gunners down below.

The earliest example of fighting-tops shown in the group is that of one of the fighting vessels of the ancient Assyrian city of Nimrud, which was situated in an angle formed by the Tigris and Zab rivers. The period designated is 1200 B. C. The two galleys designated as Herculanean are copied from carvings found in Herculaneum, which was buried with Pompeii during an eruption of Vesuvius in the reign of Titus, A. D. 79. The fighting-top of the first is somewhat similar in architecture to the fighting towers of a medieval castle. At least a score of fighting men could be accommodated on its top. The second has a large central fighting-top and four other elevations that somewhat resemble Chinese pagodas in structure.

The ship designated as English, 1012 A. D., was the type of galley much in evidence at the time William the Conqueror invaded England. An English fighting-top of the early part of the 15th century and of the latter part of the 15th century are also shown. It was in the latter part of the 15th century that small iron cannon were first mounted in fighting-tops.

A little more modern is the fighting-top of the period from 1725 to 1800. The American ships of the Revolutionary war were equipped with fighting-tops of this character. Four types of the fighting-tops of the present century complete the evolution. That of the French battleship "Magenta" is very heavy and carries two rapid-firing guns. The lower row of illustrations shows the fighting-top of an English battleship, 1905, the fighting-top of the British "Dreadnought," 1907, and the new American fighting-top, a complete departure from old styles and remarkable in contrast.


1200 B.C.
HERCULANEAN
1400 ENGLISH
HERCULANEAN
ENGLISH 1012 A.D.
1490 ENGLISH
1750
FRENCH
1900
1905 ENGLISH
DREADNOUGHT
1907
AMERICAN
1908

AN AUTOMOBILE FOR CHILDREN

Many new types of automobiles make their appearance every year, but until this car was placed on the market they all seemed to be for "grown-ups."

Weighs 300 Lb.

The machine is a graceful little automobile, and most comfortably arranged. Besides being a real car, with an actual engine and gear, and all the facilities of a real grown-up automobile, the designer cleverly kept uppermost in mind the need for simplicity on the one hand and safety on the other. The car is so light that, should it collide with an obstruction, the compact would hardly be felt. Care has also been exercised not to overpower the car, its highest speed being 10 miles an hour.

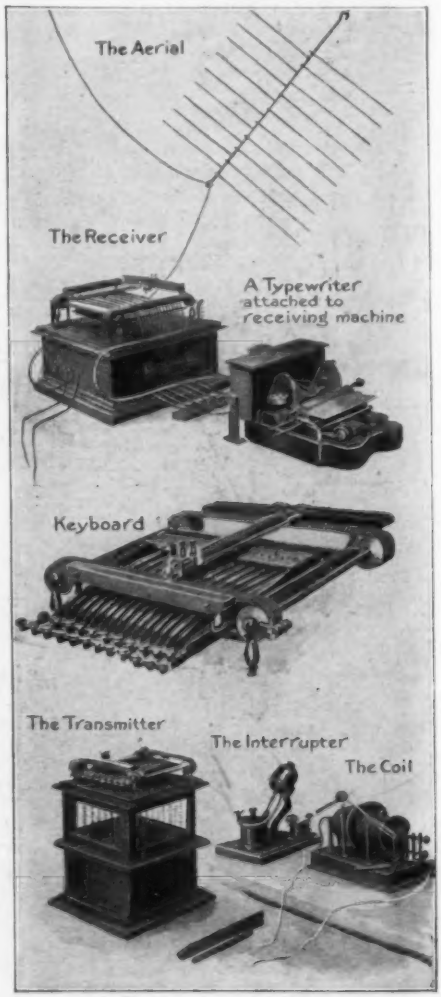
The body is of metal and of the roadster type, with metal mudguards and a bonnet of the same material. Oil sidelights and a tail-lamp are shown, the steering wheel tilts at a rakish angle, and the general appearance is brought up to a high standard. The car weighs about 300 lb.

A TYPEWRITER WORKED BY WIRELESS TELEGRAPHY

One of the latest European inventions of more than ordinary interest is the apparatus by which messages can be typewritten by wireless telegraphy. The inventor is a Danish electrical engineer, and his device comprises one form of typewriter for sending wireless messages and another for receiving.

By working the keyboard of the sending typewriter, a little pin corresponding with that particular key comes in contact with a traveling metal band, and so starts an electric wave from the antennæ of the wireless apparatus. This wave is caught by the antennæ at the distant station, is communicated to the receiving machine, and is recorded by it on paper as a letter of the alphabet.

The inventor claims that the same device can be connected to the keys of a linotype machine, thus making it possible for a correspondent to mold



Wireless Typewrites Own Messages

his news into type at the office of his newspaper while hundreds of miles away.

TALKING POSTAL CARDS

The talking postal card is the invention of a French engineer, and has become so popular in that country that the American rights have been secured and the device will be placed in the cities of the United States.

The person wishing to send a talking postal card to a friend, enters the booth and talks into a machine that records the words on the specially prepared postal card. When the recipient receives the card a hundred or a thousand miles away, he, or perhaps she, takes the card to the nearest postal booth and inserts it in a machine which talks the message it contains. The record on the postal card is indestructible and the exact voice of the sender is heard.

AN ELECTRIC TRAP FOR MOTHS

The authorities in Saxony are waging a successful war against the caterpillar plague by means of a trap which consists of two large electric searchlights or reflectors and a number of powerful suction fans.

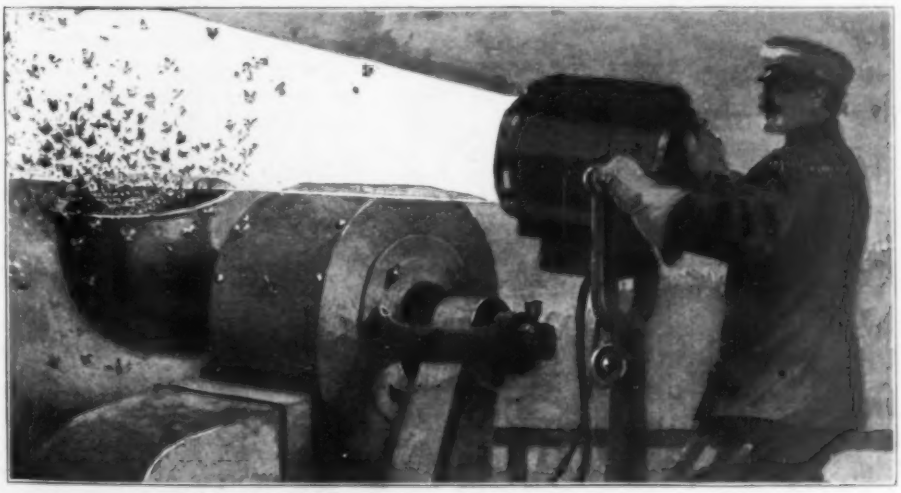
At night two great streams of light are thrown from the reflectors against the wooded sides of a mountain half a mile distant. The moths, from whose eggs caterpillars develop, follow along the brilliant beams of light until the reflectors are reached, and there the powerful currents of air swirl them down into a receptacle. On the first night no less than three tons of moths were caught.

It seems quite probable that swamps in this country could be cleared of winged pests in the same manner.

SUEZ CANAL GROWS MORE PROSPEROUS

The Suez canal, which has always been prosperous, continues to grow more so each year. The returns of shipping and tonnage of the canal for the year 1907 as compared with 1906 show that British tonnage passing through increased 1,195,937, and German tonnage 98,099 tons. The net tonnage also exhibits a round increase, the figures for the past year showing an addition of 1,282,930 tons. The increase in receipts was $1,557,000.

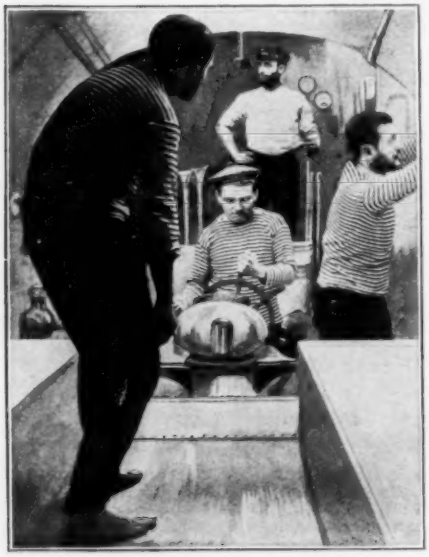
Such figures should give a pretty good idea of what the Panama canal will mean to the United States financially.



Caught Three Tons of Moths in One Night

THE INTERIOR OF A FRENCH SUBMARINE

Much interest has been aroused recently in European naval circles by the test trips of the French submarines. These trips have been to test the sea-going qualities of the little fighters, not the length of time they can stay under water.



In the Submarine "Lutin"

The illustration shows the men in the steering chamber of the "Lutin," one of the finest of the French submarines.

Climbing down the rungs of the iron ladder leading into the interior of a submarine boat is like going into a boiler shop where there is one continuous, deafening, ear-splitting racket, like a dozen trip-hammers clattering a tattoo amid a grind and rumble of machinery. At first the noise is painful and bewildering, and to make yourself heard it is necessary to shout into the ear of your companion. So intense is the strain that it is marvelous that human ears can withstand it day in and day out, yet familiarity breeds a certain immunity.

SHRAPNEL GRENADES FIRED FROM ORDINARY RIFLES

The newest and one of the most terrible weapons for the killing of men in wars is the shrapnel grenade shown in these illustrations. It can be discharged from the ordinary service rifle of any country, and is propelled by means of the ordinary cartridge. In close fighting its destructive power is claimed to be terrible.

The pin shown in one of the illustrations makes it impossible for it to explode accidentally, and until it is removed the grenade is harmless. Even when struck by a bullet it will not explode.

AN ARTIFICIAL ICE FLOAT

Among the most interesting of the large number of floats in the industrial parade held in Philadelphia during "Founder's Week," was this artificial

By Courtesy of "Ice and Refrigeration"
In a Philadelphia Parade

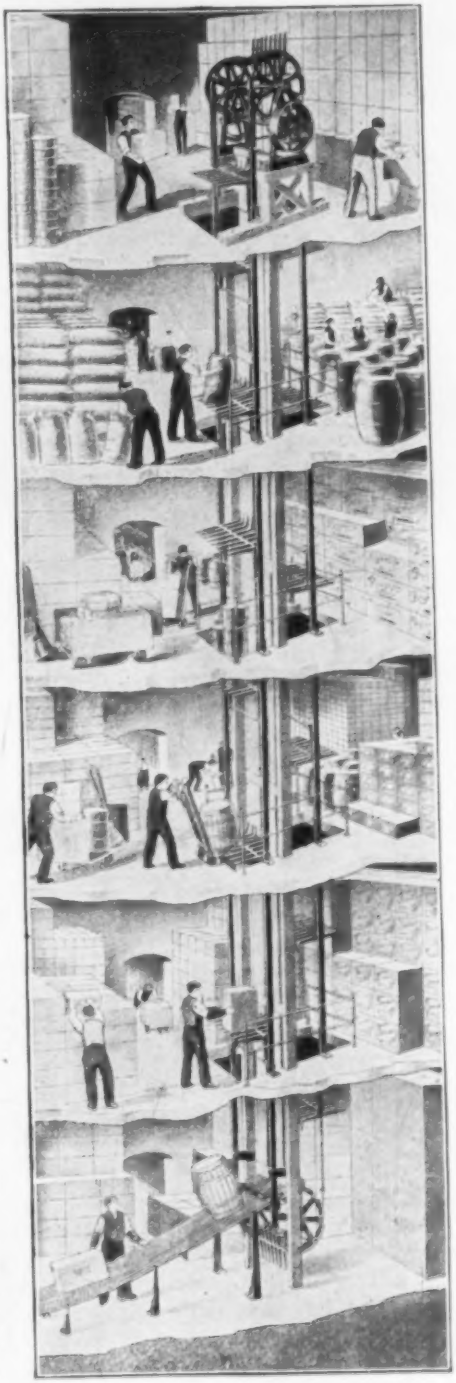
ice float. The American flag is frozen in the center of the huge cake of plate ice, which, alone, weighed 5 tons.

SELF-PROPELLED LOWERING MACHINE

The lowering machine shown in this illustration performs the lowering duty of an elevator without requiring any power other than that provided by the weight of the articles it lowers.

The power of gravitation is of course utilized, but the chief feature of this machine is that it will lower any weight from a few to several thousand pounds with the same speed. The governing power, or retarding force, is all in the rim of a wheel not more than 18 in. in diameter. It is built on the principle of a shoe brake, increased weight causing the shoes to tighten in the wheel rim and regulate its movement.

The machine consists of a series of trays suspended between two endless cables. Each cable is provided at intervals with lugs to engage sprocket wheels at the upper and lower ends of the shaft. The trays are of the finger type and arranged to discharge by sliping between fingers on the receiving



Lowers Various Weights at Same Rate of Speed

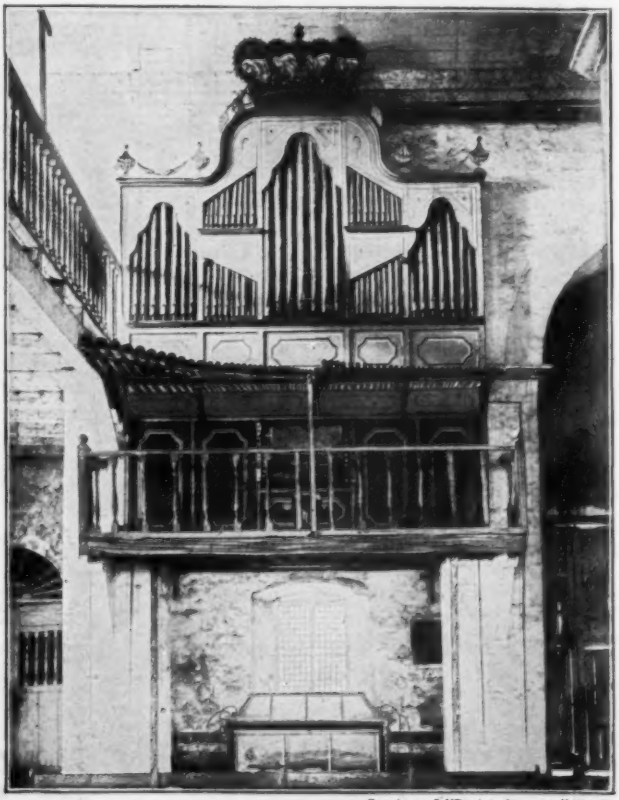
table. A steel cable runs up and down the shaft, connecting at the top with a brake, the whole so arranged that a slight pull will instantly stop and lock the machine or start it moving.

The machine was patented by a Colorado inventor, who first intended its use as a fire escape. The device is specially successful in wholesale houses, greatly decreasing the time heretofore required in getting orders down to the wagons.

A WONDERFUL BAMBOO ORGAN

In the old church of Los Pinas near Manila is a wonderful bamboo organ built by the Recoletos parish priest of that town, Father Diego Cera, in the year 1793. The upright bamboo pipes do not look unlike the metal pipes in a modern church organ, but a second set of pipes rest horizontally on a rack just above the keyboard.

The organ is still in use to this day and the bamboo is well preserved, Father Cera having a secret process of preserving the wood which he never divulged.



Courtesy of "Revista Popular," Manila

Built in 1793—Still in Use

RAILROADS PLAN TO FIGHT FOREST FIRES

The representatives of railroads in New York state, operating through counties within the state forest preserve, have pledged their support to the authorities in the investigation to provide better safeguards against forest fires. The commission is to take testimony as to the actual causes of last season's fires, and also proposes to ascertain the cost of substituting other fuels than coal for railroad motive power.

The suggestion has been made that oil-burning locomotives should be used in operating through forest lands, and the Delaware & Hudson Railroad Company has made an estimate as to the cost of such a move on its own system. This company uses about 115 locomotives in the forest reserve territory of New York. The cost of fitting 115 locomotives with oil-burning apparatus is estimated at $217,500, and the actual cost of operating with oil at $500,000 a year.

Within the last year, from the city of Detroit alone, the drug trade was supplied with enough millions of pills to girdle the earth three times, if placed in one line, their surfaces touching.

This Motor Hose Cart Carries 15 Firemen and Considerable Hose

LARGE ENGLISH AUTOMOBILE FIRE CARS

This large automobile fire-fighting machine is of the type used by the English fire brigades in Liverpool, Manchester and Birmingham. They carry a large amount of hose and about 15 firemen. The hose is stored in the large compartment on the covering of which the firemen are sitting.

THE PARISIAN DOGS' HAIR DRESSER

One of the many trades of Paris which the cities of this country cannot boast of, is that of the dogs' hairdresser. These illustrations show the old method used by the workmen of this trade, and one of the new. In the first, the rotary hair-clipper is driven by a hand-crank machine of the type formerly used in dental offices.

The second illustration shows the automobile in which one hairdresser visits his canine customers. On arriving at his destination, the flexible shaft, which drives the clipper, is connected with the automobile motor.

Old and New Method of Clipping Parisian Dogs

ELECTRIC CARS AS CARNIVAL FLOATS

On the occasion of the recent fete in honor of the Queen of Holland's

Street Car as Chinese Pagoda
Street-Car Float Representing a Thatched Cottage

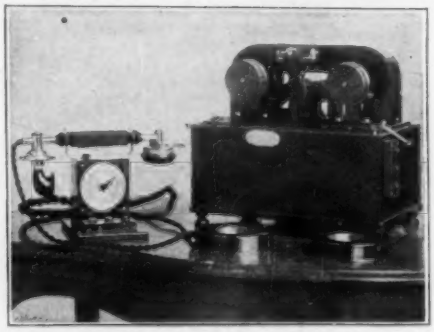
birthday, the street cars at The Hague were elaborately decorated, and figured in the procession as carnival cars. The illustrations show one of the cars disguised as a Chinese pagoda, and the other as a thatched cottage. This original idea of the Hollanders is worthy of emulation in any city where carnivals are to be held.

A TELEPHONE THAT RECORDS

For years it was an accepted fact that, if a disk or plate of steel were brought in contact with a magnet, its entire surface would become magnetized. But some six years ago a Danish inventor discovered that with an electro-magnet of sufficient delicacy he could confine the magnetism of a steel plate or wire to the point of actual contact and could cover the plate with magnetic dots, lines or circles which would not interfere with each other.

The telegraphone, illustrated in this article, is the result. It is an instrument which records telephonic messages or dictation in the actual voice of the speaker, thus making a record that can be used in court as evidence.

There are two types of the telegraphone. The first is the disc telegraphone, and is the best for commercial use because of the ease with which the



The Disc Telegraphone for Commercial Use
Receiving a Recorded Message
The Wire Type of Telegraphone

discs may be removed and handled. The disc is made to revolve in much the same manner as the disc in a talk-

ing machine, the magnet passing toward the center as it swings around. The magnet's movement is in a straight line, producing a perfect spiral on the disc of about 80 lines to the inch, so that a conversation of five minutes' duration may be recorded on a disc 12 in. in diameter.

In the second type of machine, a steel wire, one hundredth of an inch in diameter, runs from one spool to another. It passes between two pairs of magnets which magnetically charge it in exact correspondence with the sound waves which vibrate the diaphragm of the telephone connected with them. The molecules of steel in the wire receive no other impressions than those discharged by the magnets. By connecting a small electro-magnet with a telephone receiver and passing this magnet over the wire, or the wire over the magnet, the effect produced on the magnet will cause the diaphragm of the telephone receiver to vibrate and give out the same sounds as recorded in the wire.

Motive power to revolve the disc or reel the wire is supplied by an electric current obtained by screwing a plug into an electric light socket. Another attachment is a foot bulb, which, if pressed, prevents the magnet from advancing, so that the surface of the disc need not be wasted by interruptions in the dictation.

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THE AUSTRALIAN BOOMERANG

This illustration shows two Australian natives and a native of some more civilized country throwing the famous Australian boomerang. The boomerang is a weapon which seems to stultify all the laws of mechanics and projectiles, because, when hurled into space in any direction for 50 or 100 yd., it will return to the point from which it is thrown. If it strikes the object aimed at, all right; if not, it returns to be thrown again.

A HAT 14 FT. IN CIRCUMFERENCE

This giant hat is being worn by an English actress at the Coliseum theater, in London. It is 14 ft. in circumference, is of straw, and is trimmed with 15 ostrich feathers of old-rose color. It cost $600, but the advertising the actress is receiving therefrom makes the investment a good one.

NEW LIFE-SAVING DEVICE

In rescuing people from stranded ships by means of a line and a breeches buoy, it has always been necessary to fire the line from the shore, but if the invention here described proves as successful as is now claimed a line can be fired from a ship to the shore, taking with it a sand anchor which will make it fast regardless of the presence of men. In many instances life-saving crews have found it impossible to throw a line over a ship because of the rough weather, or because the ship was too far out. It is not unnatural to suppose when a ship is driven ashore that the storm is also blowing shoreward, and when such is the case a line shot from the ship would reach its mark with much more surety than if the operation were reversed.

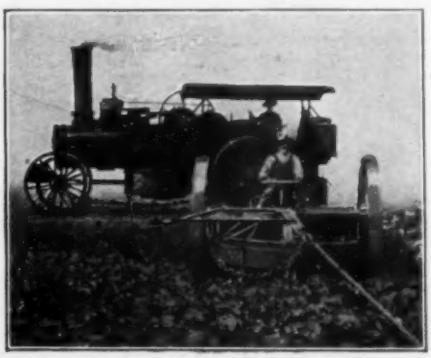
The new invention is an automatic anchoring projectile which buries itself in the sand in such a manner as to withstand any amount of pull required. The projectile has a grapnel-shaped head, and when fired from a cannon will carry a quarter of a mile with a 2-in. Manila rope attached.

It is claimed that the supervising board of inspectors of marine have approved the invention after thorough tests.

More than 50,000 church bells have been cast in Troy, N. Y., since 1825.

HARVESTING BEETS WITH A STEAM PLOW

To plow out a crop of sugar beets by running a heavy traction engine over the field would be destructive, so the method here illustrated is resorted to. The powerful traction engines are placed at each side of a field, and the plow, which is of a special design, is dragged back and forth by cables.



Plowing Out a Field of Beets

Each engine has a hauling drum horizontally attached to a vertical shaft. In this illustration the drum is shown under the engine's boiler. The field here shown is 700 ft. wide.

HORSESHOES FOR USE ON PEAT LANDS

In cultivating the peat lands in Orange county, California, a type of shoe is required which will prevent the

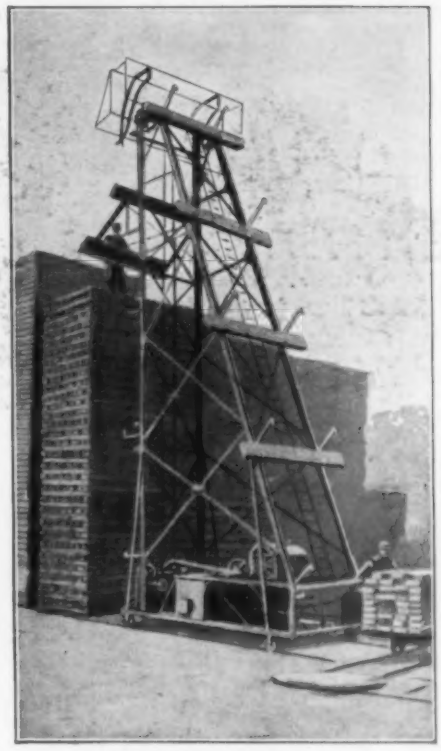
Wooden Horseshoes for Peat Lands

hoofs of the horses from sinking into the boggy ground. The shoes, or wooden sandals, shown in this illustration have solved the difficulty. The manner in which the wooden blocks are fastened to the hoofs is clearly shown.

AN ELEVATOR FOR STACKING LUMBER

This lumber-stacker, the invention of a French engineer, has recently been placed in a number of Paris lumber yards. The framework is not extensible, but the receiving arm, shown on the left side of the frame, is raised as the pile grows.

The steel angle-beams which compose the main framework of the elevator also form the channels in which the elevating chains run. To these two chains, which are of the endless variety and arranged one on each side, are fastened 12 sets of carrying hooks. The short hooks of each set carry the lumber to the top of the elevator, then, as this is reached and turned, the pieces

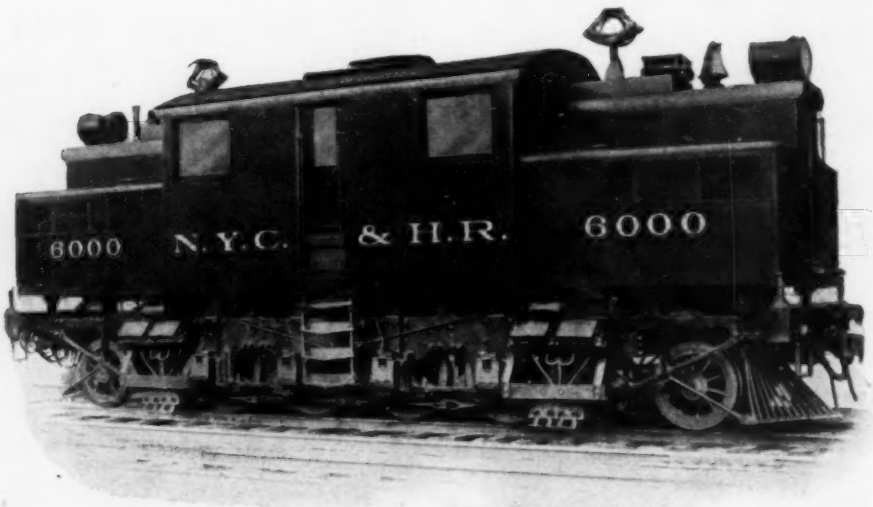


French Lumber Stacker

of timber are caught by the long hooks and carried downward to the receiving arm. The hooks abandon the pieces of timber on the arm, and this conveys it to the workmen on the pile. The chain is driven by a small motor.

A DRAINAGE AND POWER CANAL PROPOSED FOR BUFFALO

A company has been formed at Buffalo under the name of the Erie & Ontario Sanitary Canal Company to build a $20,000,000 drainage and power canal from Lake Erie at South Buffalo to Lake Ontario, providing that the federal government consents to the diversion of the necessary water. Buffalo River, Smoke's Creek and Ellicott Creek, in the engineer's plan, will have their currents reversed and flow into the canal instead of into Lake Erie and Niagara River.



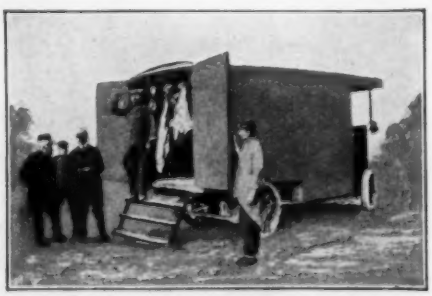
A 4,000-HP. ELECTRIC LOCOMOTIVE

The New York Central Railroad Company's famous electric locomotive, No. 600, has proven so satisfactory that 19 more locomotives of the same type and power are now being operated by that railroad.

These powerful locomotives are each equipped with four 550-hp. motors of radical design, the armatures being mounted directly on the driving wheel axles. The 2,200 hp. thus available under normal conditions may be increased to 4,000 hp. after the locomotive has passed a speed of 30 miles an hour. The maximum speed of the locomotive shown in the illustration is 85 to 100 miles an hour, according to the size of train it is pulling.

ARMY AUTOMOBILE FOR TRANSPORTING MEAT

Among the many different types and kinds of automobiles adopted by the French government for the use of its army, is this automobile for transporting meat. It is completely covered, the meats being hung from hooks in the roof.



Supplying French Troops with Meat

PHONOGRAPH TO AID TUBERCULOSIS FIGHT

The board of health of Memphis, Tenn., is to enlist the phonograph to aid in the fight against tuberculosis. A series of brief lectures on the dreaded disease, telling how to avoid it, what to do if contracted, and warning all against the habit of spitting on the streets, have been composed. A big phonograph with a huge horn will be placed on first one street corner and then another in the business section, and after introductory selections from light operas the lectures will be given.

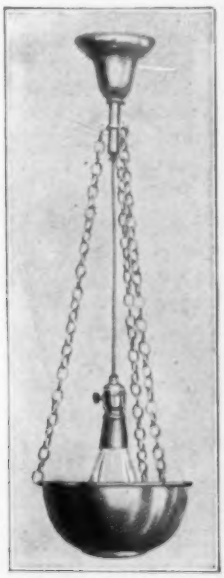
One of the most remarkable peals of bells in the world, both because of its size and elevation, has just been installed in the tower of the Metropolitan Life building in New York, 46 floors above the street.

INDIRECT LIGHTING

A Method by Which the Lamps Are Entirely Screened from View and Throw Their Light Against Ceilings and Upper Walls for Reflection

By Augustus D. Curtis

The idea of indirect lighting has gripped illuminating engineers so strongly that many of them now contend that such a system will be generally demanded and installed for house and office illumination within the next couple of years. It is a system by which the lamps are entirely screened from view and throw their light against the ceiling and upper walls for reflection, thus avoiding the glare of direct lighting, yet diffusing an illumination that reaches into every corner of a room with efficiency that makes reading in any part of it not only possible but restful.



Close View of Indirect Lighting Fixture

Photograph Taken by Light from Fixture Containing One 60-Watt Tungsten Lamp; 15-Minute Exposure

At a meeting held in October by the Chicago section of the Illuminating Engineering Society, a novel installation of indirect illumination was exhibited, the diffusion of light of which was so excellent as to receive commendation from every source.

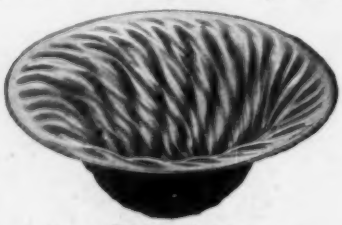
The demonstration was given in the apartments of one of the engineers, and was carried out in each room. A bedroom, so illuminated, is shown in one of the illustrations.

The system comprises special chandeliers with pendent sockets containing tungsten-metal incandescent lamps. Mounted or hung beneath and semi-inclosing each lamp, were special bowl-shaped glass reflectors backed with a silver coating. These reflectors were concealed by ornamental bowls of spun brass. From the reflectors the light is thrown up against the white or cream-tinted ceiling, and from there is cast in a diffused illumination throughout the entire room. The absence of direct illumination was at first deceptive as to

the real intensity of the illumination, but the ease with which ordinary print could be read in any part of the room showed the illumination to be sufficient as well as pleasing.

Special chandeliers are not absolutely necessary, however. Such a system can be easily installed on gas or electric fixtures already in use, assuming, of course, that the arms of the chandeliers are not unusually heavy. In placing such a system on pendent sockets it would be naturally presumed that the chandelier arms would cast annoying shadows on the ceilings, but such shadows are notable for their absence, due to the corrugations in the reflectors.

That there is undoubtedly a loss of light incident to the reflection from the ceiling is freely admitted, but it is maintained that the absence of any glare in the line of vision enables the iris of the eye to relax, admitting more light to the retina, so that, while the



The Reflector

actual illumination in candlepower may be lowered, the illumination for vision is increased.

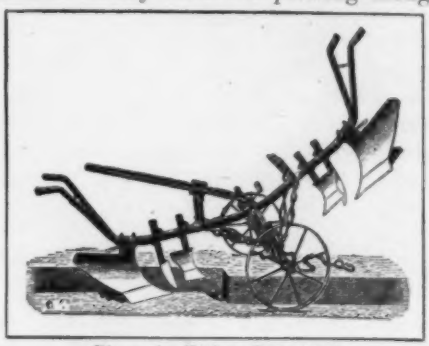
The system is, of course, not as practical in rooms that have beamed ceilings or ceilings of dark tint, but in the majority of instances ceilings are of light tint and conditions favorable.

The cost of such illumination compares favorably with direct illumination. A unit of one reflector and one 100-watt tungsten lamp gives a beautiful illumination in a room up to 15 ft. square. The cost of burning such a lamp is from ½ to 1 cent per hour, which is probably not more than it costs in the majority of cases to illuminate a room with the ordinary installation.

The same system of indirect illumination is also used with gas-light as its source.

A REMARKABLE AND POPULAR GERMAN PLOW

The one-share balance plow, shown in this illustration, is of German make and is chiefly used for plowing along

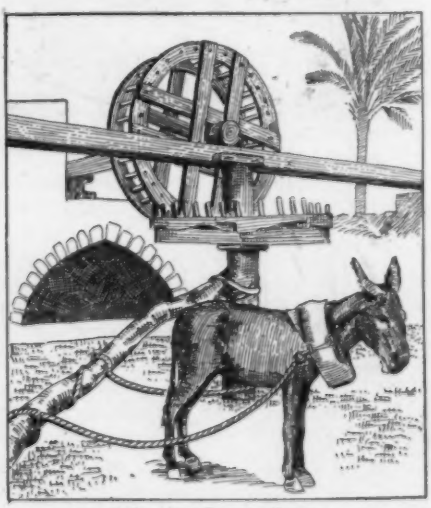


Plows in Either Direction

hillsides, so that all furrows are turned over in one direction, either upwards or downwards. In many districts of Germany, where farming is carried on along scientific lines, this plow is also used on level land in order to avoid the leaving of open or division furrows.

PUMPING WATER IN PALESTINE

The most ancient of all methods still employed in Palestine for raising water on the plains for irrigation purposes



Palestine Power Pump

is called a "Noria" by the natives. The most interesting feature of the device is a toothed wooden wheel set horizontally on an upright wooden shaft. This wheel is rotated by horsepower, as shown in the illustration, the wooden teeth engaging a large treadmill type of wheel, or cylinder, over which is passed an endless chain of buckets.

This device raises about 35 cu. ft. of water per hour.

JAPAN'S GREATEST PASSENGER SHIP

Much has been said in the past few years of the great battle for the supremacy of the Atlantic between the great ships of the Trans-Atlantic steamship companies, but the Pacific is soon to come into its own, and Japan has built the first great liner. Undoubtedly the near future will see just such battles for the "blue ribbon" of the Pacific as has recently centered all interest of shipping circles on the Atlantic.

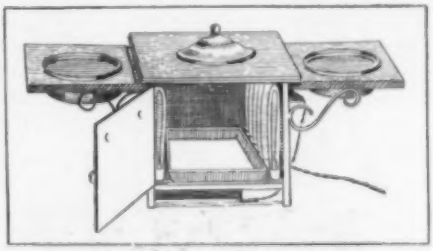
The Pacific turbine "Tenyo Maru," recently placed in commission by the Japanese, is the most modern as well as the swiftest vessel of all the steamers operating on the Pacific. It is well to recall what the wonderful Japanese have done in the past 30 years. No nation ever left the things of antiquity and laid hold of the best of modern civilization so quickly.

The first voyage of the great ship was a record breaker. The distance from Yokohoma to Honolulu was made in 8 days and 5 hr., and from Honolulu to San Francisco in 4 days, 18 hr. and 50 min. The voyage from San Francisco to Manila via Yokohoma was made in 25 days, 12 hr.

The ship is 550 ft. long between perpendiculars, and has a breadth of 63 ft. Oil is used for fuel and it is exclusively propelled by turbines, making a speed of 23 miles an hour.

AN ENGLISH ELECTRIC OVEN

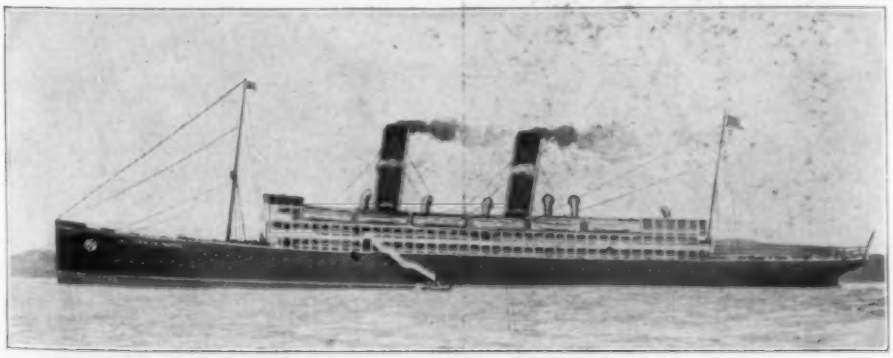
One of the neatest and most satisfactory electric ovens on the English



12-Light Oven

market is here shown. It is of the glow-lamp type, being fitted with 12 lamps of special construction. It is capable of cooking a 6-lb. joint, two vegetables and a soup, simultaneously. Its size is 13 by 14 by 15 in.

Watches were made in Nuremberg as early as 1417.



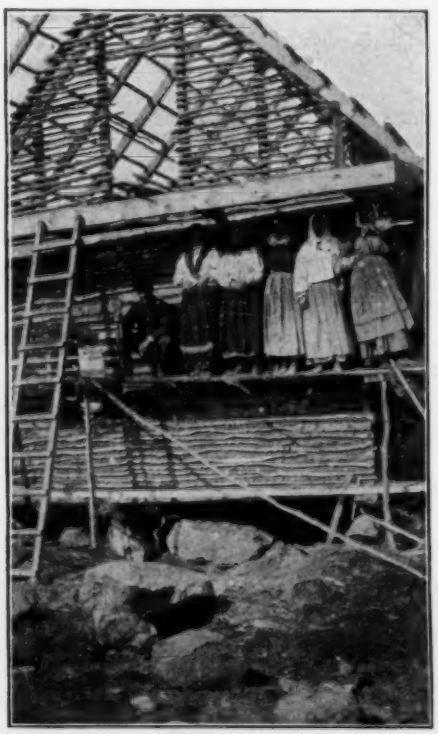
Japanese Turbiner Passenger Steamer "Tenyo Maru" the Fastest Ship in the Pacific Merchant Service

The Dukhobor Colony in Canada

Dukhobors Going West to Settle New Lands

Some time ago a body of Russian religious fanatics, known as "Dukhobors," emigrated from that country to Canada where a tract of land was portioned off for their occupancy by the Canadian government.

Since then Canada, or some parts of it at least, has had grave cause to regret its aid to these people, because, when aroused by great religious fervor, they have several times left their lands by hundreds and commenced a religious trek in a nude state. In each instance they have been rounded up by the Canadian authorities and driven back, but it has often been necessary to lock them up.



Dukhobor Women Cease Work to Be Photographed

When in a sane state, however, they have made good home-builders, as these illustrations show. The wagons they use for moving from place to place are of the same kind as the famous American prairie schooners. Two of the photographs illustrate the Dukhobor method of building homes. In one is shown the trunks of rough saplings and small trees which they use as a framework for the walls. In the other the framework is constructed of sawed lumber and timbers, the product of a Dukhobor sawmill. In house-building the women do at least half of the work, their special task being to make the plaster of which the walls are composed, and lay it on.

Another illustration shows the rush for Dukhobor land, the government portioning it off to them by lot. Still another photograph shows a Dukhobor sawmill.

The imperial railway authorities of Japan believe that much money can be saved by having their locomotives built in Japan. The works at Hyogo have just turned out one engine as an experiment and more have been ordered.

1—The Rush at the Government Office for Dukhobor Lands. 2—The Sawmill Is the Most Important Part of a Dukhobor Settlement. 3—The Framework of This House Is the Product of the Sawmill

A REMARKABLE TILE ROOF

There is an old building in one of the counties of England the tiled roof of which is behaving in such a strange

View from the South

View from the East

manner as to mystify architects as well as tourists. The building has crumbled considerable with age and the roof is undoubtedly sagging, but, although this shows clearly from one viewpoint, the same identical end appears to be arched from another.

The optical illusion is so remarkable that the camera never fails to reproduce it. Hundreds of photographs have been taken of it.—Photos contributed by A. H. Osterman.

A JAPANESE GATEWAY

One of the sights at the Californian "Venice of America" is the artistic gateway of the Japanese bazaar. The dragons are genuinely oriental, as is the entire design of the framework.

UTILIZING EARS FOR CARRYING PURPOSES

As a hint to pocketless women, an English publication suggests utilizing the ears for carrying purposes instead of just hanging useless, if ornamental, pendant earrings from the lobes.

In the African diamond fields the native workmen are not allowed pockets, for reasons quite obvious. They therefore pierce the lobes of their ears and insert a ring to which they attach cigars, tooth-brushes, and various other

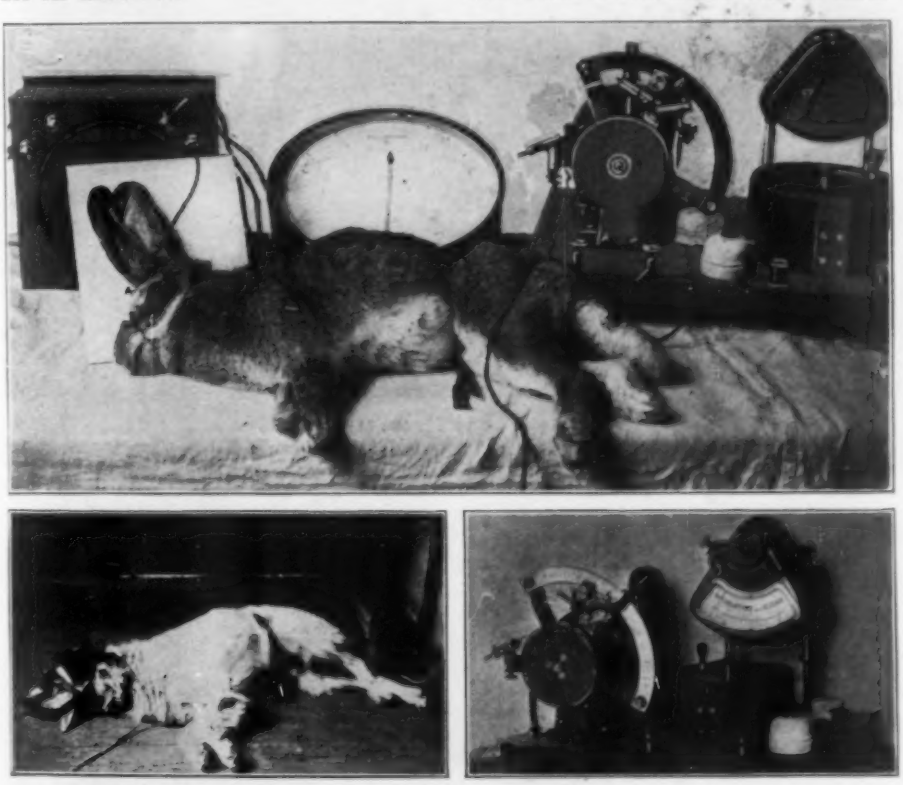
The Ear as a Carrier

articles. Tooth-brushes are mentioned because in one of these photographs a native is shown carrying one.

Japanese workmen are all labeled with the character of their trade and the name of the employer.

THE APPARATUS WHICH PRODUCES ELECTRIC SLEEP

Important experiments have recently been made in Paris by Professor Leduc in producing electrical sleep. In the majority of tests the subjects used were rabbits, dogs, and other animals, but the inventor himself, and a number of his assistants have also been placed under its influence.



Rabbit Put to Sleep and the Sleep-Producing Machine—Dog Under the Influence of Electric Sleep—The Mechanism Which Interrupts the Electric Current

The electric sleep is produced by using an intermittent electric current, the circuit being interrupted 100 times per second by means of a revolving disc. This disc is revolved 25 times a second by an electric motor, the arrangement of the disc being such that each time it revolves four interruptions are made.

In placing animals under the influence of electric sleep the method has been shown to be absolutely harmless. It is necessary at first to use a very weak current, the power being increased little by little until the subject falls asleep under its influence. It is claimed that only six volts are required to produce the sleep, and that it will last from three to four hours without harmful effects. When the subject has fallen asleep the current is cut off. In experiments made upon the person of Professor Leduc himself, he was kept under the influence for 20 minutes at two different times.

Physicians all over the world are watching the experiments with great interest, as it has long been desirable that a safe and satisfactory substitute be obtained for ether.

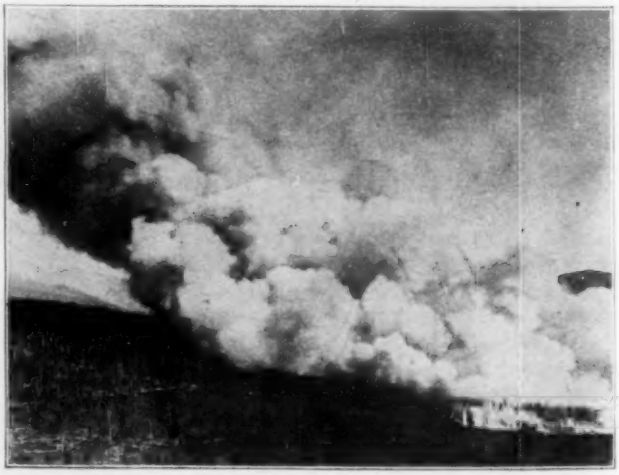
BILLIONS OF DOLLARS LOST IN FOREST FIRES

Fighting a Forest Fire by Means of Dirt Blockades

In the last few months the United States has experienced a series of devastating forest fires which has left hardly a state along the great northern boundary of the country unscathed. Forests have been razed to the ground in nearly every northern locality from the Atlantic to the Pacific oceans, many small villages and outlying homes destroyed, and more than a hundred persons burned to death. Michigan, Wisconsin and Washington suffered the most, with Maine, New York, and Minnesota close upon their heels.

Primarily, the cause of the great devastation in the past few months was the unprecedented dry spell, but enough forest land is destroyed every year to amply repay the national and state governments for an expenditure of millions of dollars for protection.

One of the most important movements for the protection of forests,



View of a Forest Fire from a Distance

and one of which the general public has learned but little as yet, is the concerted action of owners of timber in different parts of the country in organizing associations for the protection of their holdings. In the Pacific Northwest, the Washington Forest Fire Association has begun work with 3,000,000 acres under its care. The plan includes a system of patrol by rangers, and is copied after the system of the United States Forest Service for guarding against and extinguishing fires in forest reserves. Organizations of a similar kind are at work in Oregon, Idaho, Maine and New York. In Idaho, a portion of the expense is borne by taxation and paid by the state treasury.

Forest fires spring from many different causes. They are often kindled along railroads by sparks from locomotives, but carelessness is one of the worst factors to contend with. Settlers and farmers often allow fire to escape in woods when clearing land or burning grass and brush, and a burning match, a half-smoked cigar, or glowing tobacco from a pipe have been responsible for the loss of millions of dollars in timber land. Hunters and prospectors neglect to extinguish camp fires, or build them where they may burrow into the thick turf beyond reach, to smolder for days or weeks, and break out as a destructive fire when no one is near. Many fires are started for malice or revenge, and the forest is often burned out by huckleberry pickers to increase the next season's yield.

Every person who has occasion to go into a forest, whether he be a hunter, naturalist or lumberman, should be careful never to drop a burning match or tobacco where there is anything to catch fire, never build a fire in leaves, rottenwood, or other places where it is likely to spread, and never leave a fire before it is completely extinguished. It should also be borne in mind that a fire against a large hollow log is dangerous because it is difficult to be sure when it is completely out, and that in windy weather and in dangerous places, fires should be confined to holes, and the ground cleared around them.

CORK CULTIVATION IN SPAIN

The cultivation of cork in Spain is a considerable industry, three views of which are shown in these illustrations. The first shows how the bark is stripped from the trees, and the second is the interior of a vat-room in which the bark

Cutting the Bark—Steaming—Ready for Shipping

is boiled or scalded. The boiling is necessary to soften the bark so that it can be flattened out without breaking into pieces. The third illustration shows a pile of the bark thus treated, drying out. The lower bundles are held

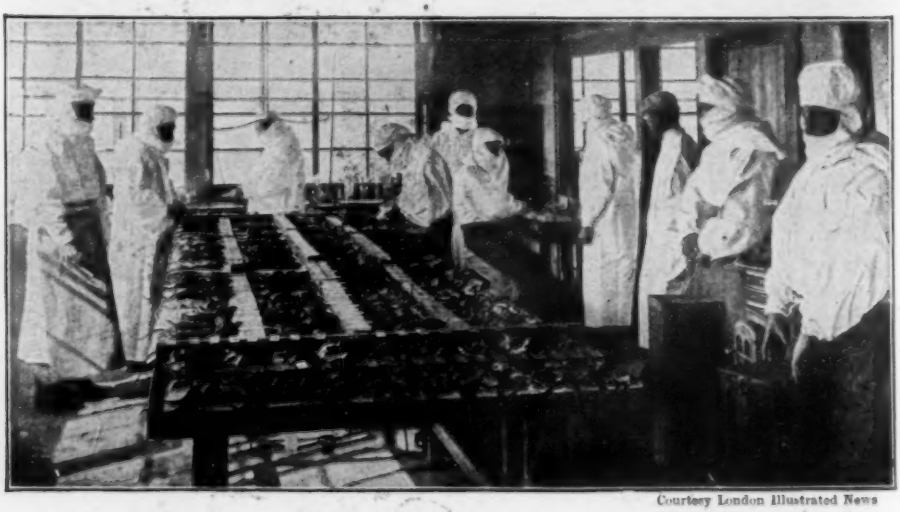
flat by the weight of the upper bundles, and these are in turn held down by heavy timbers.

EXTERMINATING RATS IN JAPAN

Realizing that the bubonic plague is a disease of rats, carried by them into the homes of man with frightfully fatal results, the Japanese government is waging an extraordinary war against them with wonderful success.

Not only has a price been set on the head of every rat, but every person who brings in a rat receives a numbered ticket which might entitle the holder to a large prize in a special lottery, and rat poison is being supplied free to all who apply. During the periods of house-cleaning, superintended by the sanitary authorities, more than usual precautions are taken to see that not a rat escapes. When a house, shop, or warehouse is found to be thickly populated by the rodents, the place is disinfected, a rat-proof zinc fence being placed around it to cut off their escape. These fences are embedded in the ground so that the rats cannot dig their way beneath them.

In Tokio the government laboratories are kept busy dissecting the dead bodies of the rats, so as to ascertain just how many are infected with the plague and in what localities the most so affected are. The bodies are labeled when brought in.



Courtesy London Illustrated News

Dissecting and Examining Dead Rats at a Laboratory in Tokio

Evaporation from cork stoppered bottles is much less than from glass stoppered bottles.

This Illustration Shows the Interior of One of the Erecting Shops of the Great Armstrong Ordnance Works at Newcastle-on-Tyne, England. The Huge 12-In. Gun Turrets Are Set in Deep Pits Which Correspond with the Positions They Will Occupy on Board Ship

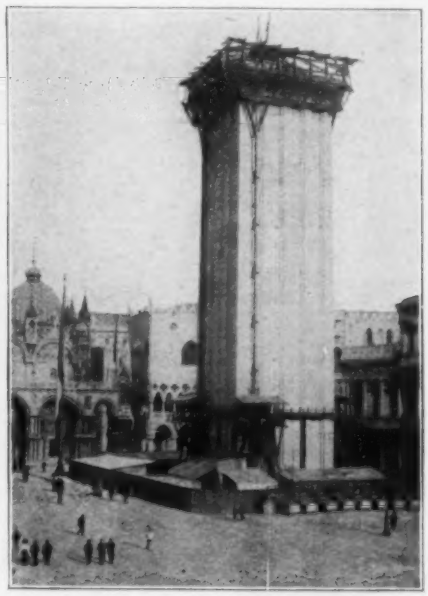
PHOTOGRAPHING THE PROGRESS OF THE MOON

This interesting photograph, showing the progress of the moon across the sky, was taken in midwinter at Duluth, between the hours of 11 and 12 p. m. The exposure lasted one hour, in which time the moon moved from the point at the lower left to the upper right end of the beam of light. Without an explanation the beam of light would probably be taken for a Geissler electric tube hung in the branches of the tree.—Photo by G. A. Sloan.

THE NEW CAMPANILE IN VENICE

In July, 1902, the famous campanile of St. Mark's, Venice, fell crashing to the ground, carrying away with it the library of the Royal Palace. This illustration shows the main shaft, now completed, of the new campanile designed to take its place. The old campanile was commenced about 900 A. D. by the Doge Pietro Tribuno and finished in the 12th century. The tower was 325 ft. high and 42 ft. square at the base.

The platform shown at the top of the shaft is the feature of the construction work, from the viewpoint of engineers. The platform is roofed over, and, as it is raised as the construction advances, is called a traveling roof. All outside timbering has been discarded and this roofed-platform is carried by four slender supports, one of which

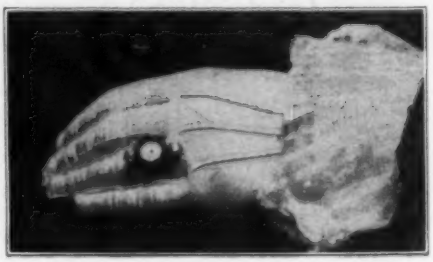


Main Shaft of New Campanile

can be seen running down the side of the shaft. The platform is raised as required by a screw apparatus.

WATCHES WORN AS RINGS

The latest Parisian novelty in watches and rings is a combination of the two to be worn on the ring finger of the left hand over the glove. The watches



are from one-half to three-fourths of an inch in diameter and studded with jewels.

A ROCKING COUCH

The rocking couch shown in this illustration is a decided novelty in the furniture line. When not extended it forms the chair shown in one of the illustrations. When the seat extension is raised and the back lowered the couch is formed. It is easily adjusted to any desired position, both as a couch

The Two Positions

and a chair, by simply turning a handle. A perfect balance is maintained at any angle.

NEW INVENTION FOR GARAGES

This device, recently placed in the garage of the Automobile Club of France, carries the smoke and gases from the exhaust of an automobile into the open air, thus keeping the air clear within the building. A fan operated by an electric motor is placed in the

Exhausts the Fumes

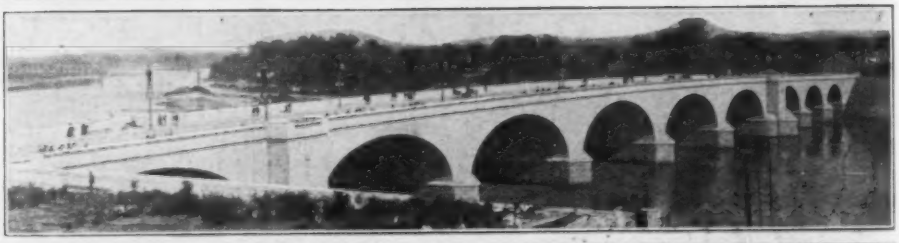
exhaust pipe to draw the smoke and gas from the engine and discharge the same outside the building.

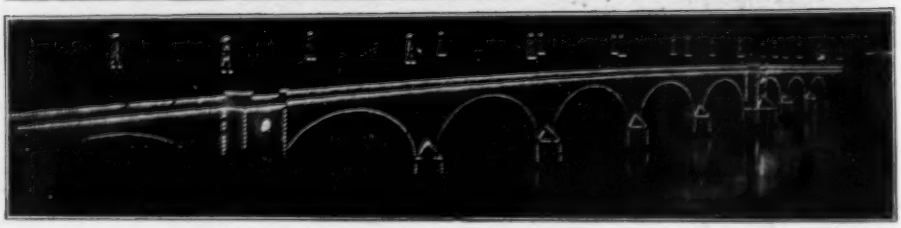
NEW COMPASS OF GREAT VALUE

At a recent meeting of the League of German Naval Architects, a new compass was exhibited which is revolutionary in its nature. Unlike all other compasses, it has no magnetic needle. It is in the form of a gyroscope, and when suspended in a certain way will always adjust itself parallel to the earth's axis.

The invention is regarded by German experts as of great importance for battleships, or any type of ship of steel construction. Magnetic compass needles are frequently deflected by the steel construction of ships.

It is claimed that a Chinese resident of Canton, named Hu Chuen, has invented a wireless telegraph system which is not only a success, but also much simpler to operate than European or American systems.





The great bridge just completed a few months ago over the Connecticut river at Hartford, is one of the largest of granite construction in the world. Its length is 1,192 ft., its width 82 ft., and its height above low water mark is 45 ft. It has nine arches.

The bridge was commenced in 1904 and completed October 8, 1908. In the evening of that day occurred the pyrotechnic display shown in one of the illustrations. The head shown in the display is that of Senator Buckley, president of the bridge commission. The bridge is shown in fireworks along the river front.

The third illustration shows the bridge electrically illuminated.

A RAPID CHANGE DEVICE

The ticket booths of one of the New York ferry companies have been equipped with the arrangement of slots shown in this illustration, for making rapid change. When many passengers are crowding past the booths and more than one is presenting his or her money at the same time, it is often difficult to hand the proper change back to the right person. The slots remedy this

Change Slots at Ticket Booths

difficulty because the passenger places the money in one of the slots or troughs and shoves it through the window. If change is required, the attendant slips it back into the same slot from which it was received.

Such a device could also be made useful at amusement parks, picture shows and other kinds of exhibitions where change must be quickly made.

ONE DRAWBACK OF THE SELF-CONTAINED MOTOR CAR

One of the drawbacks of the self-contained motor car for railroad use is in the fact that the power is self-contained. This statement may at first sight appear a little dense, but every type of self-contained motor car has the same disadvantage, this disadvantage being in the fact that the motive power and the car body are practically inseparable and it is impossible to care for the former in the same place and manner as other locomotive power on the road is cared for. It is also necessary to put the whole car out of commission whenever the motive power needs attention.

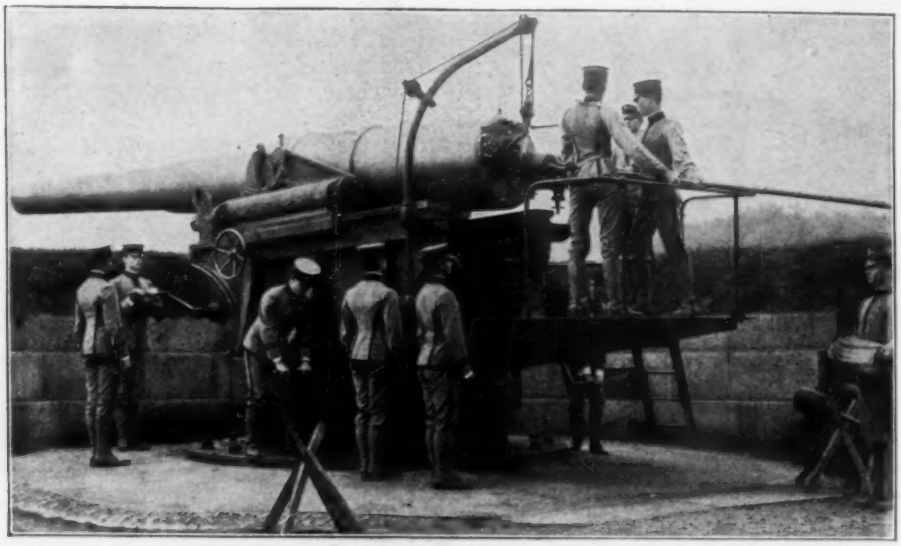
This disadvantage has been overcome by the Bavarian State Railways in a manner which would seem adaptable anywhere. The Bavarian government has been operating self-contained motor cars for a number of years, and, finding the above stated condition to be a great disadvantage, has discontinued the building of the self-contained type of cars in favor of a small, but very powerful 4-wheeled locomotive which can be coupled to a light combination passenger and baggage coach and perform the service with equal satisfaction. The arrangement simply amounts to separating the motive power from the passenger compartment of a motor car and permits the former of being taken care of in the regular engine house.

COMPRESSED AIR FOR AERONAUTS

Aeronauts very often find breathing difficult when flying at high altitudes, especially when at greater heights than six and eight thousand feet. This device, which is composed of a tank of

Breathing at Great Altitudes

compressed air and a tube and mouthpiece to convey the air to the aeronaut, has been devised for use when the atmosphere becomes too thin for comfort.



Coast Defense Battery Drill at West Point

AUTOMOBILES IN CURIOUS PLACES

Turkey was the last nation in the world to admit the automobile. In fact, it is only within the past year that the prejudice of the Sultan has been overcome and the empire opened to horseless vehicles. The Sultan's prejudice was in all probability caused by his fear of assuming the responsibility for anything new that might afterwards be used against him. The principal European automobiles are now well represented in Turkey, although the Balkan states boast of no fine touring conditions, the country being among the most mountainous in Europe.

In Japan and China, automobiles are now used in large numbers. In China it is a familiar sight to see a speeder darting in and out of the traffic, to the consternation of the natives.

In the Asiatic countries of Siam, India and the Straits Settlements the industry is doing an enormous business. The regular annual shipment of automobiles to Siam has been more than doubled within the last year. The king of Siam is a great believer in the automobile.

WOODEN BEAR AS A BEE-HIVE

This wooden bear is a bee-hive and it contains many honeycombs. It is one of the many curious ideas of the owner of a German "beegarden," as they are called in that country.

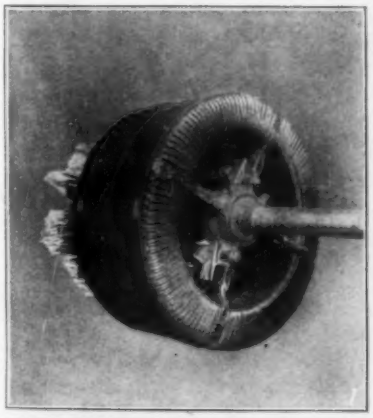
A Bear that Got His Fill of Honey

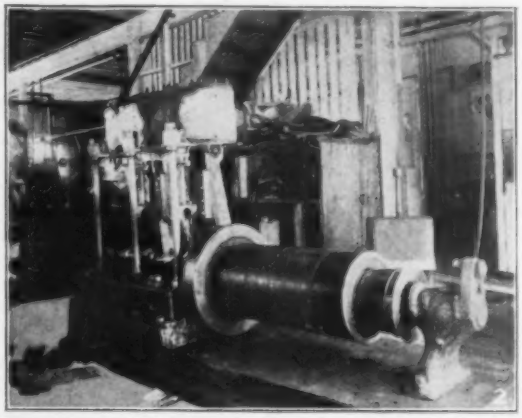
THE NAVY ELECTRICAL SCHOOL AT MARE ISLAND

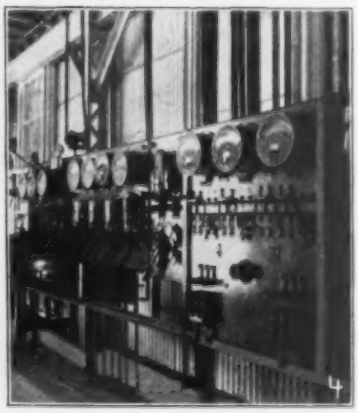
Electricians Enlisted in the U. S. Navy

The United States Navy maintains two schools for the instruction of its electricians, one at the Brooklyn navy yard and the other at the Mare Island navy yard, California. The school in the west is the smaller of the two, but its benefits to the men enlisting in the far western states is great.

The course is similar to that taught at the eastern school, and is divided







A 32-Kw. Armature Wound by Members of the School. Engine and Dynamo Being Rebuilt by Naval Students. Part of the Dynamo Room of the Mare Island School. Switchboard of the Mare Island School Built by Students

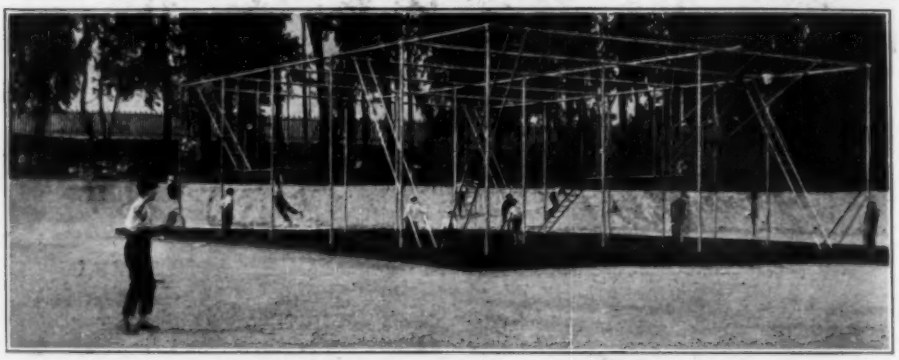
into five sections, known as the theory, mechanical, practical, ship's watch and wireless telegraph sections. The students at the school are regularly enlisted men, and only such as have sufficient general education to take advantage of the instruction given are taken.

The field for mechanical men in the navy is continually broadening and the pay becoming better.

BRIDGE OVER THE NORTH SEA-BALTIC CANAL

One of the most impressive and unique bridges in Germany is that near Levensau, shown in the accompanying illustration. It was built for both railway and highway traffic over the North Sea-Baltic Canal. This interesting bridge is of arch construction, having a span of 536 ft.

The total weight of the steel work in this bridge is nearly 6,000,000 lb. The castle-like towers on each side of the canal are of artistic and attractive design, the approaches being of masonry, with stone steps rising gradually and curving down to the banks of the canal.



Amusement Apparatus in Los Angeles Playground

FUN ON SCHOOL GROUNDS

Los Angeles, Cal., is one of the most progressive cities in the country in providing ways and means for its school children to play on the school grounds. The playing apparatus here shown is perfectly built and arranged for the fun of the younger generation. The main pipes of its galvanized framework are 3 in. in diameter.

Spans North Sea-Baltic Canal

OIL WELL BURNS TWO MONTHS

The great oil well fire in the San Geronimo district of New Mexico burned continuously for two months before it could be extinguished. The oil was ignited on July 4, and a gas blow-out which immediately followed caused the opening in the earth to be widened, and the whole drilling outfit, derrick, engine and all, were engulfed.

The outpouring of oil caused a miniature volcano to form, the crater being several hundred feet across. The flame from the burning hole was 160 to 180 ft. wide and rose to a height of about 1,800 ft., the smoke and vapor rising to an additional height of about 16,000 ft. It was a grand spectacle, the flame being easily seen for a distance of 200 miles.

The fire was finally extinguished, after destroying oil estimated at 5,000,000 barrels, by six centrifugal pumps which threw mud and water into the caldron day and night for two weeks.

The Flames Were Visible 200 Miles

After the flames were extinguished the mammoth well continued to flow oil at the rate of 150,000 barrels a day and the services of several hundred Mexican soldiers and other laborers were required to construct temporary earthen reservoirs to hold it. Even then great quantities of the oil escaped into the San Geronimo river and adjacent lagoons.

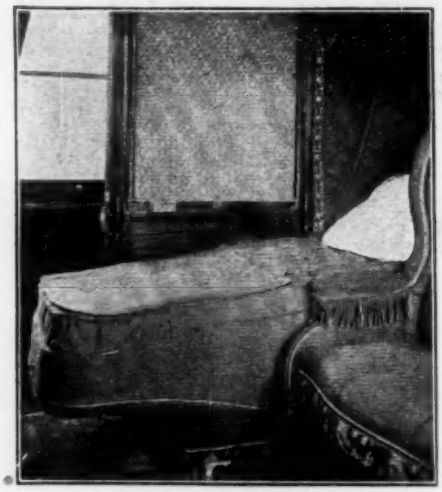
The fire was without doubt the greatest oil fire in the history of the world. The nights were turned into day while it lasted and fine print could be read at night within a radius of 100 miles of the burning oil, the illumination was so brilliant.

Of such grandeur and force as to create a feeling of awe within the stoutest heart, it was viewed by the ignorant Mexicans for 200 miles around with fear and superstition. They wondered if it would spread until the whole world was consumed, and muttered and hinted at all sorts of dire things because the Americanos had not been content with what the Creator had placed on top of the earth for them, but bored great holes in the earth, tapping the fires of hell.

Paint used from fresh keg lead is not so good as that which has stood some months.

A COUCH-BED FOR FRENCH RAILROAD CARS

This couch-bed arrangement has been adopted by the Paris-Lyons-Mediterranean Railroad Company for use in the Wagons-de-Luxe, the name given to cars in France of the same nature as the American Pullman.



Luxurious Railroad Couch

EYE-GLASSES FITTED WITH MIRRORS

An eye-glass with which the wearer can see what is taking place behind him as well as in front, is the latest invention of French opticians. The eye-glass itself is of the ordinary type, but on the outer edge of the rim of each lens is mounted a small circular mirror. The mirrors are pivoted so that the wearer can so arrange them as to get a clear view of any object behind him by looking a little sideways. The mirrors do not obstruct the forward view in any way.

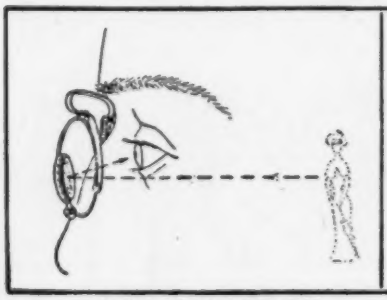
The device is especially useful for persons who are deaf, insuring them safety in crossing busy streets. Probably, such an eye-glass would also effectively keep a room of students hard at work while the teacher's back is turned.

THE CONCRETE BOAT

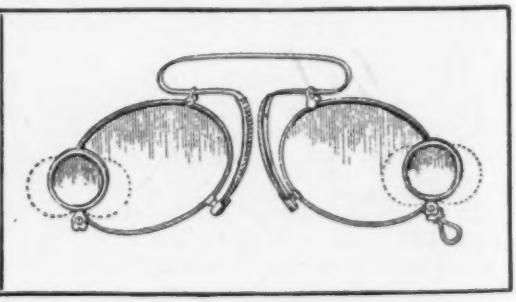
The success of Italian engineers with concrete as a material for building boats is exerting an influence on marine experts of other countries to such an extent that a large number of experiments are in progress with results that may mean much for the future.

Concrete has, without doubt, many excellent points as a shipbuilding material. In the first place it offers less resistance to propulsion in water than wood or steel, and no painting is required. In the second, the cost of concrete boats is about one-half that of steel and the maintenance cost is comparatively nothing.

Its strength and practical indestructibility is also a great factor in its favor. In a recent test made by the Italian government, a 1,000-ton concrete boat was rammed by a much larger steel vessel. The result was serious damage to the steel craft and very little harm to the concrete boat. Various trials of this nature have led the Italian government to consider armoring its warships with concrete.



Seeing Behind Oneself



Pivoted Mirrors on Glasses

THE SUPERIOR-DULUTH BRIDGE

This illustration shows the reconstructed Superior-Duluth bridge. Part of it was torn away by the Str. "Troy" in 1906, and not until October, 1908, was it opened again for service.

THE PIANO-HARP

The dolcette, which is probably one of the newest musical instruments placed on the market, is a harp played on a keyboard similar to that of a piano. The lower half of the instrument somewhat resembles the piano and the upper portion is like an Italian harp.

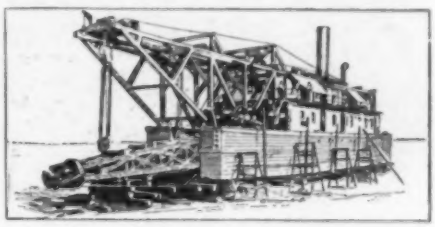
The feature of the instrument is its remarkable action. Either a single tone or a tremolo tone can be produced by a single depression of a key. When struck and immediately released, the ordinary harp tone is produced. By depressing the key and holding it down, a tremolo tone follows which is similar to that of a mandolin. By playing tremolo tones with one hand and single tones with the other, the effect of a mandolin quartet, accompanied by an Italian harp, is produced.

The instrument stands 6 ft. high.

Keyboard Plays Harp

REPAIRING A DREDGE

This unwieldy looking vessel is a river dredge raised out of the water on ways to be repaired. The dredge is lighted with electricity and just above the framework to which the heavy arm is attached is a large electric arc.



Ready for Repairs

TOO MUCH SHOOTING RUINED FIRE ALARM SYSTEM

For many years the residents of Murray, Ky., were notified of fire within the confines of their town by the discharging of guns, and this rather novel system proved so satisfactory that it was still in vogue up to within a few months ago. Then, however, came the nightrider disturbances, and the discharge of guns became so frequent and misleading that in a number of instances the alarms for fire were disregarded. The mayor found it necessary to issue a circular, changing the alarm system from gun firing to the ringing of bells and blowing of whistles.

MAKING BASKETS OUT OF CHIPS

1—Splitting the Log; 2—Tearing Off the Strips; 3—Weaving; 4—Juvenile Basket Sellers

The country people living in the Erzgebirge mountains, a range about 125 miles long between Hungary and Saxony, make baskets from chips or splits of the soft wood growing on the mountain sides. It is usual for every member of a family to have some share in the making of the baskets, and in many instances basket-making is the trade of every family in a community.

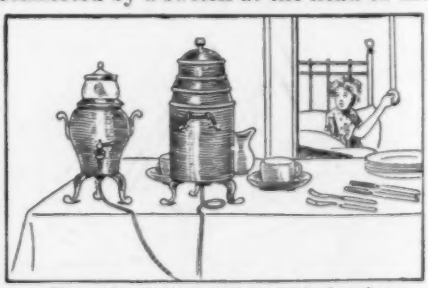
The first illustration shows a mother and son sawing the logs into the proper lengths, the father splitting them, and two smaller children preparing to deliver a load of finished baskets. The second illustration shows the method of bending and shaping the chips, and the third illustration shows a whole family at work; even to the cat. In the fourth illustration two children are shown delivering the smaller baskets.

A ton of steel will make about 10,000 gross of steel pens.

BREAKFAST MADE EASY

For the dwellers in apartments or in other small living establishments where servants are made conspicuous by their absence, the housewife's chief assistant is electricity. One of her most dreaded duties is to rise in the cold, grey dawn of a winter's morning to prepare an early breakfast. This is made easy by the method here illustrated:

The electric cooker and percolater are connected by a switch at the head of the

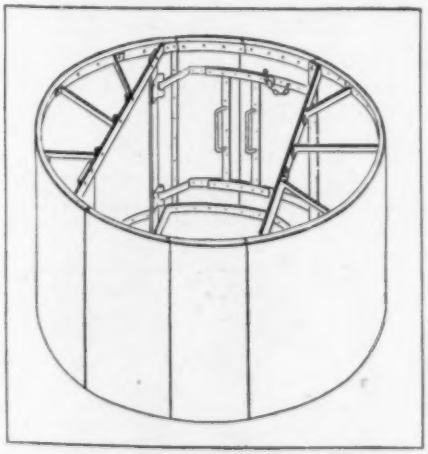


Turn the Switch When You Awake

bed. The cereal is placed in the cooker and the coffee in the percolater the night before. When the alarm clock rings in the morning the housewife simply turns the switch and electricity does the rest. An electric oven for warming rolls can also be connected with the head of the bed in the same way, and probably before long some arrangement will be devised which will bring water to boil at the proper time and automatically drop eggs into it, withdrawing them again when the required three minutes have expired.

COLLAPSIBLE STEEL FORMS FOR CONCRETE SHAFTS

Although concrete has been used to some extent in the construction of sewer shafts, catch basins, cisterns, silos and like structures, its use has not been general because of the lack of good forms devised for such work. It is not economical to make a separate form for each shaft or cistern, except when the same be of large size. Such forms as have been designed for such purposes are almost invariably made of wood, usually of many sections. They require considerable time to put up and take down, and on account of being alternately exposed to wet and dry conditions soon warp so that the sections cannot be put together.



Easily Handled, Cannot Warp

The collapsible steel form overcomes these defects in wood forms. It is easily set up or taken down, cannot warp, and, being made of galvanized iron, it can be washed after using. If lubricated with crude oil or other greasy substances, it will last for many years.

The form is made in two sections, each section forming a semicircle. Each section is braced so as to afford clear working space inside of the form, the two ends of each semicircle swinging inward on the hinges attached to the braces.

A PHOTOGRAPHICAL CARICATURE

Horrible facial abnormalities are sometimes illustrated to show the result of the excessive use of intoxicants. This face, which is in reality as comely as the majority of faces, is the result of the purest of pure water and a big bottle. The person who thus grievously caricatured himself stood, when photographed, so that his face was about 12 in. back of the bottle.—Contributed by Clarence A. Swoyer.

A motor-operated revolving door has recently been installed in a Boston store.

A SPOON WITH TWO BOWLS

This spoon is unlike other varieties of mixing spoons. Two slotted bowls

Does Double Toil

are attached to the one handle, thus doing double the work of the old-style single spoon. For stirring fruits or for beating eggs or cream it is said to be especially good.

WHY APPLES SHRINK IN STORAGE

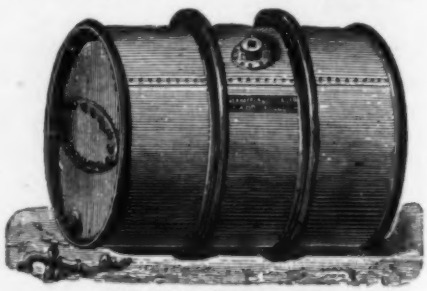
It has been proved by different experiments that apples in storage, although remaining sound and firm, lose in weight, the reduction after six months of such treatment being a little more than 3½ per cent.

That the shrinkage is due to respiration and not to mere drying out of the water was proved by analyses which showed that the percentages of dry matter and water remained practically constant. One of the chief products of respiration is carbon dioxide, and by determining the amount given off by the fruit in different temperatures it was possible to measure the rate of the changes taking place within the cells of the fruit. It was also demonstrated that the chemical changes take place from four to six times as fast at summer temperatures, and from two to three times as fast in cool cellars, as in cold storage.

BARRELS MADE OF PRESSED STEEL

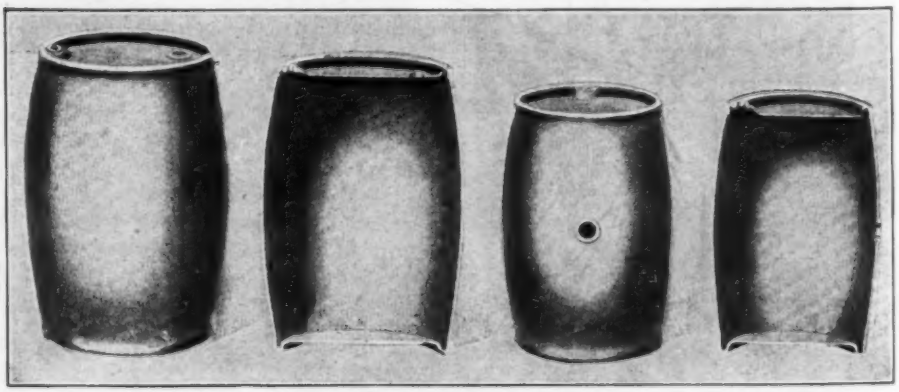
Although steel barrels have been used for several years for storing and shipping oils and other liquids, these are the first seamless steel barrels of bilge form ever turned out.

The seamless process has been perfected only after prolonged experiment-



Old Style Steel Barrel

ing by a Milwaukee steel company. The barrel is formed from a single piece of steel by a series of operations in hydraulic presses of special design, and with the exception of the upper head, which is hard-brazed to the inturned edge of the body, it is wholly seamless. The bungs and vent holes are reinforced with ring plugs of rivet



Views of New Seamless Steel Barrel

Taken at 10 O'Clock at Night

steel upset in place under a 200-ton hydraulic riveter.

The barrels are made in three sizes.

PICNICKING ON RAFTS

In many parts of Germany picnic parties have discovered that it is much more pleasant to float about on a log raft and have the meal on board than to have to go ashore when the time to eat approaches.

Such a raft is, of course, only practical and safe on rivers or small lakes. Many ingenious German boatmen have built rafts of the type shown in the illustration and rent them out to picnic parties for a small stipend. If a breeze is blowing the raft is carried slowly along, the trees acting as sails.

PHOTOGRAPH BY LIGHT FROM A STEEL PLANT

The nightly illumination from an immense steel plant puts to shame the most spectacular fireworks displays which attend the celebration of the 4th of July, yet it does not aim to be spectacular, and is not devised for the amusement of the multitudes. It is simply one of the outward manifestations of the great steel industry of the country. The photograph was taken at South Chicago at about 10 o'clock at night, by the light of the furnaces. —Photo by C. Burghardt.

The Argentine parliament has decided to spend $55,000,000 on the construction of warships and the re-arming of the field artillery.

Safe on Rivers or Small Lakes

ORNAMENTAL WASTE PAPER BOXES FOR PARKS

Ornamental as well as useful are the new waste paper boxes recently installed in the Library Park at Dayton, Ohio.

A wooden pedestal, nicely decorated with scroll work and mouldings, is arranged with small doors on each side for the reception of waste paper. On the top is placed a large jardiniere filled with plants, and a door at the bottom is provided for removing the paper at intervals.

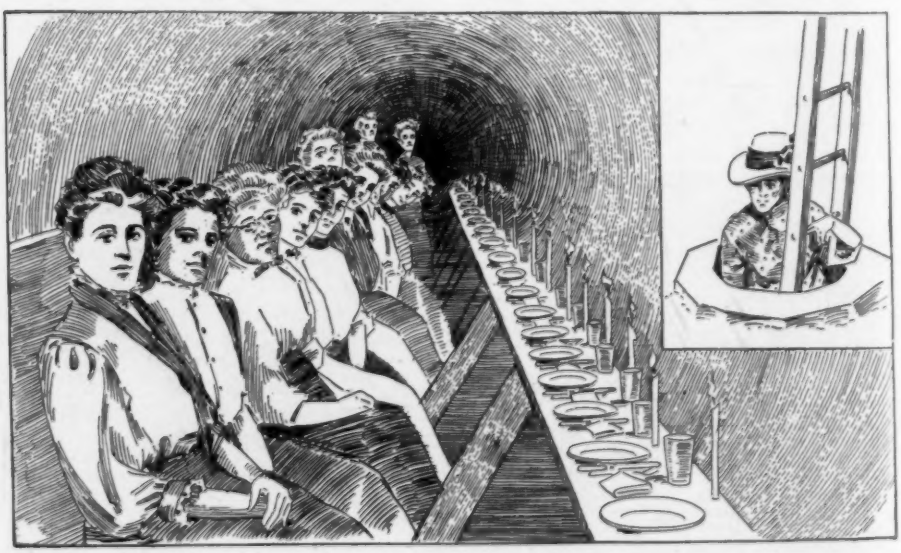
The pedestals are painted a dark green with white trimmings and add quite materially to the appearance of the grounds.

The fumes of gasoline from automobiles, according to a London authority, are accountable for the decrease in the death rate of that city. Partially burned carbonized matter is claimed to be a splendid antiseptic and the creosote vapors from the motor are in reality a health tonic and bracer.

DINING IN A SEWER

Some months ago a huge concrete sewer conduit was completed in Franklyn Park, a suburb of Chicago, and to celebrate the event, which ended a legal battle of 16 years, the ladies served a banquet within its interior. The table was built along one side for a distance of several hundred feet and benches were used as seats. Hundreds of candles were used for illuminating the sewer.

The smaller illustration shows the first woman descending.



Longest Banquet Hall in the World

TREE-STUMP CONVERTED INTO A HOUSE

It is not extraordinary in a newly developed country to find dwelling places of a unique character, but this stump-house in British Columbia is of more than ordinary interest. It is not a make-believe house, but a real house in which a family of five live. The

A Hollowed Out Stump

stump was all that remained of a once giant tree.

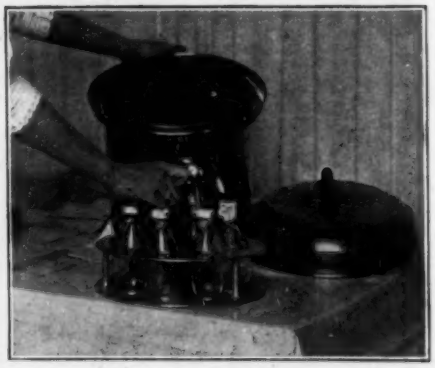
PASTEURIZING MILK FOR TENEMENT BABIES

The world's foremost specialists on tuberculosis, who recently gathered in Washington from all quarters of the globe for the International Tuberculosis Congress, found much to interest them in the work of the federal and state governments and of organizations and individuals for the preservation of the public health.

It is significant, however, that of all the features of this advance the one which attracted the most attention is the humanitarian project for providing pasteurized milk at less than cost for the poor of the tenement districts.

The plan for providing purified milk for babies whose parents are too poor to pay for this necessity, originated with Nathan Straus, the New York merchant-philanthropist. It was originally limited in the scope of its operations to New York City, but a movement is now on foot for the extension of the undertaking to other large cities. The public-spirited men who are pushing this crusade have also intro-

Filling Bottles with Pasteurized Milk
Placing Bottles Filled with Milk in Automatic Cooling Apparatus



Capping the Bottles with Ingenious Stopper
Placing Bottles in Automatic Bottle-Washing Machine

duced a home pasteurizer which will enable any household, no matter how isolated its location, to enjoy milk purified by the latest approved method.

Nathan Straus maintains by his own contribution in New York City, seven stations where the pasteurized milk is distributed, and during the warm summer weather this number is augmented by ten additional stations. Through these channels alone more than four million bottles of milk are distributed each year, and 2,500 babies have been fed daily on milk from which the infectious germs of tuberculosis and other diseases have been removed.

Under the system which has been created by wealthy men working for the common good, milk is distributed in nursing bottles, modified to suit the needs of babies of different ages, at less than cost—5 cents a quart.

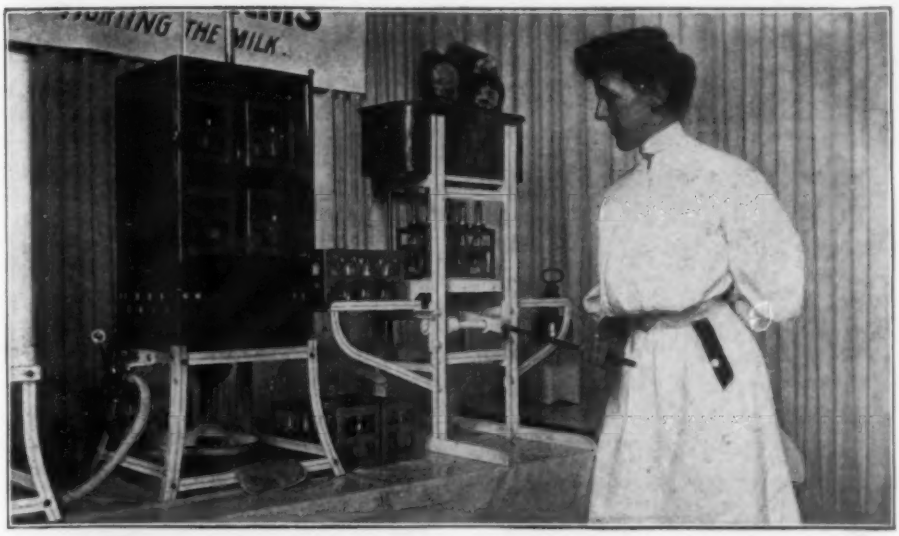
In addition to this service to families that can afford to pay something for the milk, although unable to pay the full price asked by dealers, tens of thousands of bottles are furnished each year to the poor in exchange for coupons issued by charity workers or on the requisition of physicians laboring among the poor.

The method by which this milk is pasteurized has many advantages over the older system of sterilization or boiling, as a lower degree of heat is applied, which, although sufficient to kill all noxious germs, does not affect the nourishing quality and allows the good taste to be retained.

The milk is first dropped through a fine sieve onto coils cooled by ice. The milk is transferred from this cooler to an automatic bottle-filling machine. After the bottles are filled the next step is the heating or pasteurization. This is accomplished by gradually increasing the temperature of the hot water surrounding the bottles until a temperature of 157 degrees is reached. The bottles are left in this temperature for a period of 20 minutes. The milk is re-cooled by an automatic machine which sprays the bottles with cold water.

A supplementary machine, likewise automatic in its operation, is the bottle-washing apparatus which cleans the bottles inside and out with boiling water.

The home pasteurizing outfit, a machine only recently introduced, is contained in a copper vessel but little larger than a chafing dish This appliance will, it is believed, prove the salvation of many babies in rural districts remote from modern sanitary dairies and laboratories.



The Home Pasteurizing Outfit

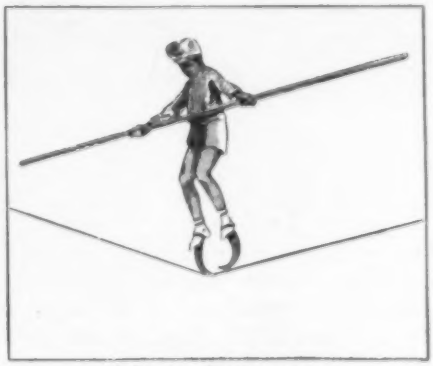
HUGE ARCH OF SWISS RAILROAD BRIDGE

One of the largest railroad-bridge arches in the world is now under construction as part of the new Wiesen viaduct in mountainous Switzerland. The building of the falsework for the great arch was in itself a great engineering feat. The arch is of stone. Its height is 300 ft. and it spans a chasm 180 ft. wide. The viaduct is completed by six smaller arches, each having an aperture 65 ft. wide.

Height of Arch 300 Ft.

WALKING A TIGHT-ROPE ON STILTS

Walking a tight-rope with bullocks' horns as stilts is a difficult circus "stunt," of a nature even Japanese tight-wire performers have not yet approached, and one which would undoubtedly take well in an American circus. A native of India is the performer and his circus ring a broad expanse of desert.



A Daring Performance

AN EAGLE AND A HORSE IN FLOWERS

Two interesting examples of the florist's art are shown in these Decoration

Eagle Made of Flowers

day illustrations. One is an eagle with a breast made of white roses. It was made for a Kenosha, Wis., aerie of the "Eagles." The other is a floral horse

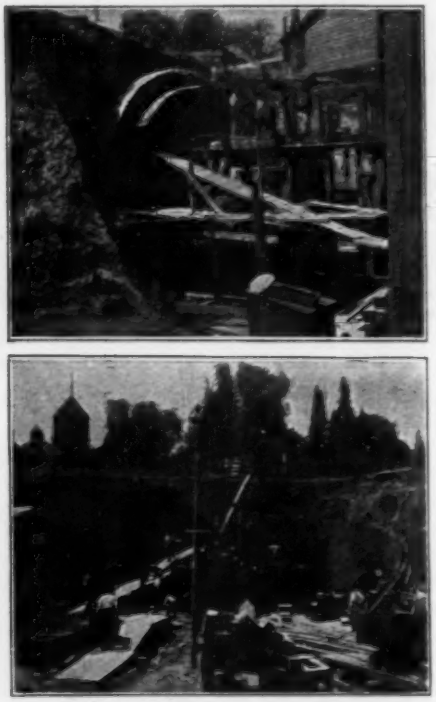
Unique Floral Piece

placed in front of a mausoleum at Pittsburg, Pa.

Heat the head of a short carriage bolt to a welding heat and hammer it flat. When flattened out it will form an almost perfect thumb screw head without any dressing. Thumb screws can be made quickly in this manner.

UNUSUAL TUNNEL WORK

One of the railroad tunnels being constructed by the Harriman interests in Los Angeles, Cal., runs under a cemetery. In the construction work, the roof is first temporarily timbered and



Tunnel Under a Cemetery

then the structural iron arches are placed in position.

RUBBER YIELD PER ACRE

The following statistics taken from the P. A. M. Report for the year 1907 gives a comprehensive idea of the average return of rubber by the acre on the cultivated area in the Malay states:

	Acres in Bearing	Crop 1907, lb.	Yield per Acre, lb.
Johore	610	114,688	188
P. Wellesley	385	63,896	166
Perak	1,419	209,104	147
Kapar	3,257	465,248	143
Batu Tiga	2,247	242,256	108
Kuala Langat	219	32,368	148
Kuala Selangor	92	11,648	127
Klang	1,555	209,804	135
N. Sembilan	1,540	187,152	122
K. Lumpur	1,653	148,456	90
Total	12,977	1,684,620	130

OPERATING ON A LIONESS

One of the rarest surgical operations ever attempted upon an animal was recently performed at the Cincinnati Zoological Garden in the removal of a 25-lb. tumor from a lioness. Three surgeons, assisted by a half dozen of the attendants, performed the operation.

Never was there a more unwilling patient. The big, untamed beast had to be coaxed into a small, narrow cage having a movable rear partition, which was afterward drawn up close to the front bars, squeezing the beast tightly against them. Numerous iron rods stuck into holes in the rear partition held the animal securely in position for the surgeons to operate. The animal was placed under the influence of ether, but at no time were the iron rods withdrawn. A pound can of ether was used during the operation.

SWIMMING THE ENGLISH CHANNEL

The latest attempt to swim the English channel was made in August by T. W. Burgess, one of the European

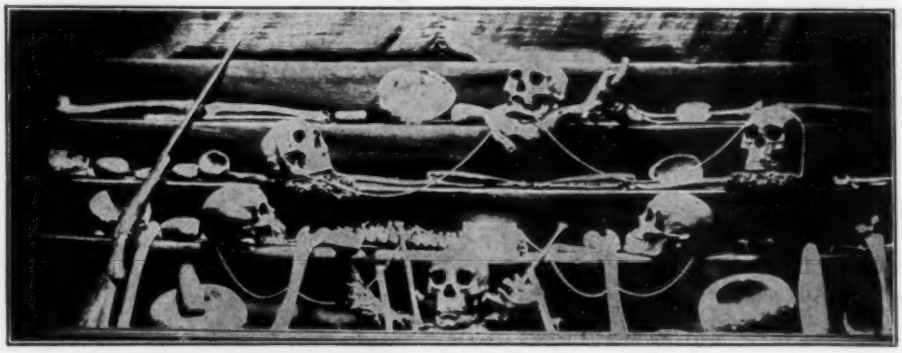
Swimmer Who Failed

champions. After being some 20 hours in the water he was compelled to give up within about half a mile of the French coast. The failure that is almost successful is always the most heart-breaking.

A Pound Can of Ether Was Used During the Operation

RELICS OF THE PAST

During the past few years many scientists, archeologists and curiosity seekers along the California coast have invaded the islands of San Clemente, San Nichols and Santa Catalina in hope of discovering the "Hidden Temple," built by the ancients of these places and described in 1542 by Father Torquemada, Cabrillo's first historian.



The Reward of Archeologists' Search in the West

Although the temple has not yet been discovered, the searchers have been rewarded by the finding of many curios. One of the illustrations shows six complete Kinkipar skeletons, 25,000 pieces of Kinkipar wampum or money (on strings), and an endless variety of arrowheads, spear-points, mortars and pestles, fetishes, stone flutes, sinkers, and knife blades. These were all discovered on the island of San Clemente, a bleak and barren piece of land 22 miles in length.

The other illustration shows M. O. Bolser, leader of one of the searching parties, unearthing a ghastly specimen with the aid of an abalone shell. The shell is much preferred to a spade or shovel, as great care must be taken in uncovering the relics.

M. O. Bolser Removing a Skull with an Abalone Shell

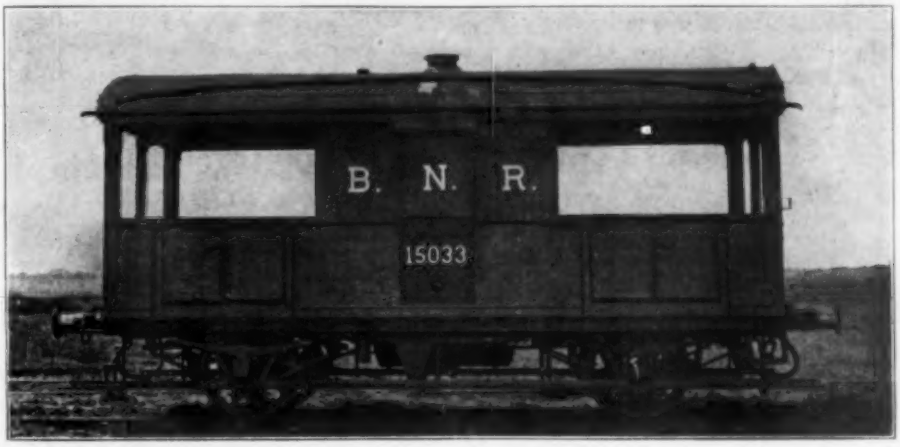
ORANGE TRAIN OF 46 CARS

The length of some of the orange trains of the west is extraordinary. This train, consisting of 46 loaded "fruit express" cars, propelled by four locomotives, is 2,324 ft. long and has a gross weight of 1,933 tons. Two of the engines are at the front of the train and the other two are eleven cars ahead of the caboose. Trains are run in this way up the west slope of the Sierra Nevada mountains, where for nearly 83 miles the grade is 2.2 per cent. The

trains are run through from California to Nevada without remarshaling the cars.

AN OBSERVATION-CAR TYPE OF CABOOSE

The new caboose vans of the Bengal-Nagpur Railway in India have two large observation platforms, but lack the observation cupola with which the American railway is always provided. The bunk-house in the center is 8 ft. 11 in. long, and the observation platforms are each of about the same length. The necessary weight for so light a car is obtained by means of cast-iron ballast weights, six in number, which cover the whole underframing.



Observation Platform at Each End

ELECTION RETURNS ON RAILROAD TRAINS

One of the most interesting innovations of the recent presidential election was the arrangement made by at least ten of the great railroad systems of the country to furnish election returns all through the night to the passengers.

Special wires were run from the main offices of these systems into the offices of one or another of the many metropolitan newspapers, and the latest returns were placed on board the trains at every stop and posted in conspicuous places. When regular stops were infrequent the trains were slowed down at small towns and the returns, especially telegraphed to the station agents of those places, picked up.

TIN CAN CLUBS TO GROW FORESTS

There is a man in Monterey, Cal., B. H. Green by name, who expects the Tin Can clubs of this country, now organized or being organized, to supply us with forests to replace those now being destroyed.

Mr. Green states that he has been successful in planting tree seeds, nuts and cuttings in refuse tin cans, and can now show an oak tree 25 ft. high only 8 years of age, and a redwood grown from seed which is now 30 ft. high and only 12 years old. He insists that a tomato can with a fair-sized hole punched through the bottom is just the thing needed to start a tree in, and if the good dirt in the can is never allowed to become dry the growth will be amazing. Later the little trees are transplanted without removal from the cans, for the rust eats away the bottom sufficiently to allow the roots to free themselves as they need more room.

Mr. Green's assertions are sufficient to explain the Tin Can clubs and their purpose. Anyone can start such a club anywhere.

JUMPING THE GAP RESULTED IN DEATH

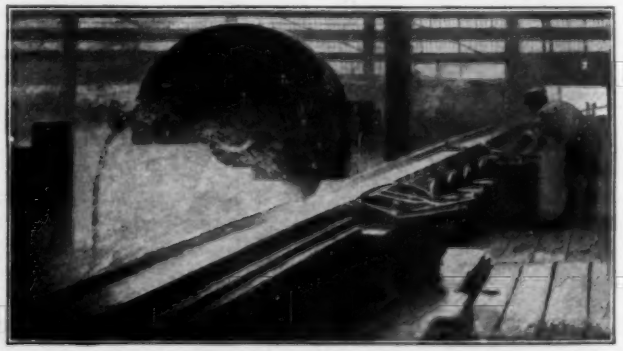
The Rider's Legs Are Artificial

This photograph was caught by the camera man just as the performer was falling through the air in an unsuccessful attempt to "leap the gap" on a bicycle. The rider, whose legs were artificial, was badly hurt by the fall and confined to a hospital at Allianee, Ohio, for some time. On his recovery he commenced exhibiting again, and in August was killed in Cleveland in just such an accident as the one photographed.

SAWS THAT MELT THEIR WAY THROUGH STEEL

This illustration shows one of the three largest friction saws in the world. They are used in one of Chicago's huge construction plants and can cut through a 10-in. steel I-beam in 14 seconds.

These saws or disks are so made that they generate enough heat at the point of contact to literally melt their way through the metal being cut. The cutting edge of the disks is roughened by simply hacking with a fish-tail chisel. The saw shown in the illustration is 52 in. in diameter and is made of flange steel. Driven by a 100-hp. motor, it makes 2,000 revolutions per minute.



Cuts 10-In. Steel I-Beams in 14 Seconds

PHONOGRAPHS TO RECORD DYING STATEMENTS

Many are the devices used by the police and subsidiary departments of a large city, but none is more interesting than the phonograph as it will be used by the coroner's department in Chicago. The phonographs will be used when possible in making records of the last denials or confessions of murderers about to pay the life penalty, and the dying statements of persons who have met with foul play.

These records, in the actual voices of the persons deceased, will be filed away for reference or used in court as testimony.

THIS DEVICE MAKES TOUGH MEAT TENDER

This device, with almost as many teeth as a brush has bristles, is designed to aid in the mastication of tough steaks. The piece of meat is

Breaks All the Fibers

placed on the plate and the teeth forced into it. The action breaks and divides the fibers.

UNDER VIEW OF CONCRETE VIADUCT

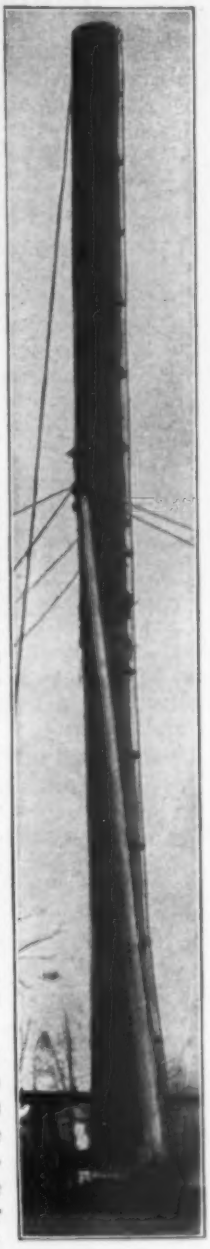
This illustration shows the under side of a concrete viaduct or bridge, 14 ft. high, and with the same span. The reinforced beams are 2 ft. deep and 1

Unique View of Bridge

ft. thick, placed 2 ft. apart. Its surface is trough-shaped and covered with rock ballast. It carries double tracks on which electric interurban cars are run.

A HIGH STACK ERECTED IN ONE PIECE

This illustration shows a 160-ft. stack raised in one piece and the tackle with which the task was accomplished. The stack is 6 ft. in diameter and weighs a little more than 54,000 lb. It is part of an industrial plant at Perth Amboy, N. J.



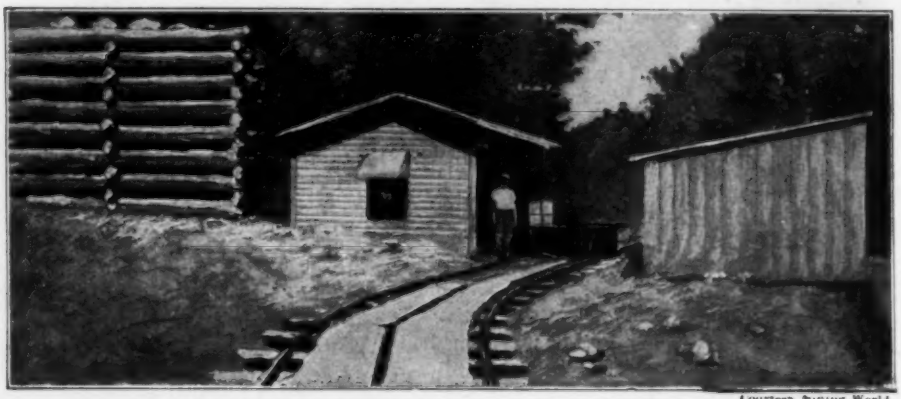
THE COST OF SPEED AT SEA

The fastest warship in the world is without doubt the British torpedo boat destroyer "Swift," which on her preliminary trials maintained for some hours a speed of 36½ miles an hour. A remarkable feature of the "Swift" is her cost, which amounts in matter of hull and machinery to $1,237,310, and $14,150 for the armament, a total of $1,251,460 for a vessel of only 1,800 tons.

The greater part of her cost is due to her speed, as was the case with the cruiser "Indomitable," which, had she been designed for 26½ miles an hour instead of 28½, would have cost $1,500,000 less than she did. If the "Dreadnaught" had been designed for 21 miles instead of 24 her cost would have been $2,150,000 less than it was.

MINIMIZING THE DANGER IN POWDER PLANTS

The buildings of a modern powder plant are divided into two areas, known as the safety and danger areas. The buildings in the danger area are small and widely separated. No more than from two to six men work in each building, so that should an explosion occur there would not be a great loss of life and property.



Courtesy Mining World

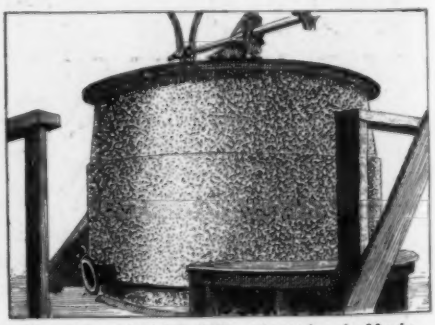
In the Danger Zone—Showing Log Explosion Guard

A typical modern plant is located at Joplin, Mo. The danger zone is about a quarter of a mile from the safety zone and extends along the bluffs of a creek for about a mile. The buildings are several hundred feet apart and are protected by abutments built of logs and filled with earth or rocks, which, in case of accident, throw the force of the explosion out over the creek.

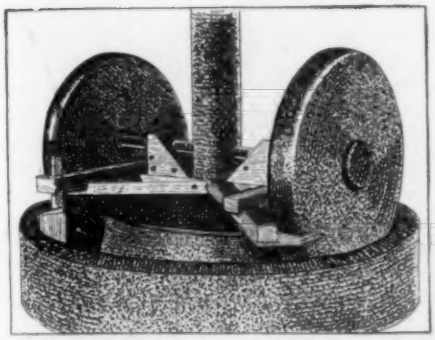
The most interesting part of a dynamite plant is the nitrator building, and in it occur fully 75 per cent of the explosions which make the business so dangerous. The nitrator, in which the nitroglycerine is made, consists of a large lead-lined tank containing coils through which cold water is circulated, and a mechanical stirrer which insures an immediate mixing of the charge. A weighed acid mixture, consisting of about two parts of sulphuric to one of nitric acid, both highly concentrated, is run into the nitrator. The agitator is started and the acid cooled to about 50 deg. F. The sweet glycerine (the kind you use to put on chapped hands) is allowed to run slowly into the acid mixture, the rate of flow being regulated by the attendant in charge so that the temperature never rises more than a few degrees throughout the process of nitration. About 10 parts of glycerine is added to about 65 parts of acid, and it is the action of the acids on the sweet glycerine that makes the powerful explosive.

After the glycerine has run into the machine, the agitation of the charge and the circulation of the cooling water are kept up until the conversion of the glycerine into nitroglycerine is complete and the temperature has fallen to the required degree. The agitator is then stopped and the nitroglycerine, together with the spent acids, is dropped by gravity into a tank called the separator.

The cause of so many explosions in



Nitrator in Which Nitroglycerine Is Made



Mechanical Powder Mixer Grinding the Powder Like a Flax Seed Oil Mill

the nitrator building is the partial decomposition of the charge in the nitrator or separator. The charge becomes heated as the decomposition starts, and if the condition continues for any length of time it results in an explosion, which wrecks the building and usually kills the two men in charge. To guard as much as possible against this danger, an immense tank, which stands directly under the nitrator and separator, is kept full of water. If the temperature rises and is apparently getting beyond control the entire charge is drowned in this tank, cooling so quickly that an explosion is usually averted.

A WISCONSIN MILKMAN'S EQUIPMENT

This milk delivery outfit usually draws attention in Junction City, Wis., although it travels its milky way every day. The beast of burden is a forty-

For Delivering Milk

second cousin of the cows that furnish the milk.—Contributed by Elmer Grover.

WRECK OF A LOCOMOTIVE

In viewing a serious railroad wreck the first thought is of its horror, but often, as in this instance, this first feeling is overshadowed by wonder that so many miraculously escaped death or serious injury.

This wreck occurred on the Frisco railroad, near Carthage, Mo. Some-

Terrible Wreck in Which No One Was Seriously Injured

thing on the engine gave way, hurling it and part of the train over an embankment into the Spring river. The smoking car was turned completely over and pitched almost upright into the water. The chair car was overturned and the Pullman was only saved from going over by crashing into a heavy growth of timber, yet not one of the passengers was seriously injured.

MAKING MODEL MECHANICS OUT OF BAD BOYS

Cincinnati has an institution whose sole business is in the making of useful mechanics out of bad boys. A youngster embarked on the road downward is given a compulsory chance to make a good citizen out of himself, but whether he does so or not he is skilled in one of the good trades which will enable him to earn a living anywhere before he is let go.

The institution is the Cincinnati House of Refuge and it has been turning out carpenters, shoemakers, ironworkers, blacksmiths, bakers, tailors and other skilled workers for several years. Many of them are now among Cincinnati's most skilled mechanics.

These young mechanics, while learning their trade at the Refuge, are at the same time receiving a good schooling. Their work at the benches supply the institution with clothing, shoes, and other garments. The bakers and cooks prepare the food. It is an interesting fact that the majority of these boys would rather be carpenters and ironworkers than bakers or tailors. Probably 75 per cent of all turned out are graduated as carpenters. Many of them become so interested in their work that they prefer to stay after their compulsory time, and before they leave become highly skilled.

The three illustrations show a young tailor making the garments of the institution, a carpenter learning his trade at the bench, and one of the boys making the shoes of his fellow companions.

A REMARKABLE SUBMARINE-CARRYING VESSEL

Exceptional interest was taken recently in Liverpool shipping circles over a strange craft designed and specially built for transporting two Japanese submarines, and the remarkable method by which the submarines were placed on board.

The new type of vessel is a steel craft 240 ft. long, having a 38-ft. beam. Her engines are placed aft, and with the main deck removed ready to receive the two submarines she presented the appearance, for at least two-thirds of her length, of a mere shell.

The method of floating the submarines on board, however, was the most startling. The "Transporter," as the vessel is appropriately named, was placed in a drydock and submerged by

The Transforming Power of a Trade on Formerly Incorrigible Boys

opening her hull and allowing the water pumped into the dock to enter. The two submarines were then admitted to the dock and floated into position directly over the specially built cradles. The water was pumped from the dock, and, as it gradually subsided, the submarines fell into their allotted positions in the hold of the vessel. The

"Transporter" Being Submerged to Receive Submarines

opening in the hull of the "Transporter" was then closed, the hold pumped out, and enough water pumped back into the dock to float her.

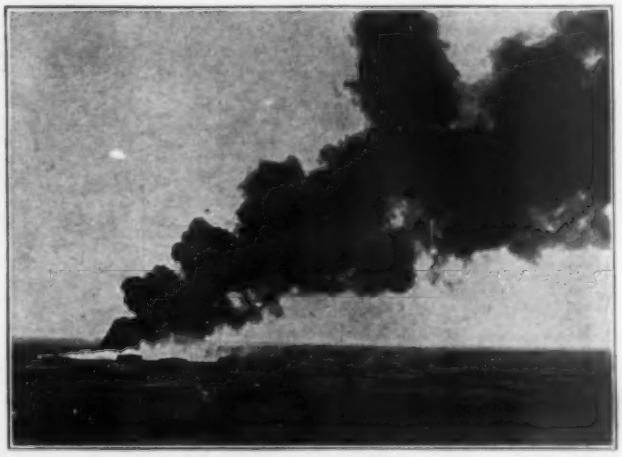
AN OIL TANK FIRE

This photograph was taken while one of the huge tanks of a Kansas oil company was burning. The tank farm on which it stands covers 280 acres of land near Neodesha and has 64 tanks with an average capacity of 42,000 bbl. each. This fire cost the company nearly $40,000.

The recent celebration at Quebec, Canada, brought out the utter ineffectiveness of granting to any one concern the exclusive right of taking moving pictures of a public event which is not confined to an inclosure. An English concern paid $4,000 for the exclusive right to take pictures, but at least half a dozen other companies had their operators scattered through the city and each secured fine views without expending a cent.

SLUICING AN IRRIGATION DITCH BY AID OF A PLOW

Digging an irrigation ditch by sluicing instead of the ordinary method, although not entirely new, presents a number of interesting features. The work is being done in connection with improvements to Boyd lake, one of the largest reservoirs in northern Colorado, and consists of an open cut, a little more than 1½ miles long, through orchards and valuable farming country. In starting the cut, two trenches, each 5 ft. wide, were dug 16 ft. apart, and water from another ditch ran through them. The core, or ridge of earth between the two trenches, was plowed down and sluiced away by the water. Then a 40-ft. pole, mounted on wagon wheels, as shown in the illustration, was thrown across. To this timber was attached a plow, and the outfit was drawn up and down the cut by a team of horses on each side. The plow was held in position in the bottom of the ditch by guide ropes attached to the plow handles. One man on each side held the ropes. When the bottom of



This Fire Cost Nearly $40,000

Novel Method of Plowing Irrigation Ditch

the ditch became uneven from plowing, a spring-tooth harrow was substituted and did excellent work. The earth, loosened by the plow, was sluiced along to the Big Thompson river where it was deposited.

As soon as the ditch was cut deep enough to be below the level of Boyd lake the headgate was opened and its water used for sluicing. The same water used for sluicing was also sold for irrigation.

The cut is connected with Boyd lake by a concrete tunnel 300 ft. long. This tunnel is 30 ft. underground and has a concrete headgate tower 30 ft. high. When the sluicing of the cut was begun the lake had a water surface 3½ miles long and a mile wide. After two months of sluicing the water had lowered 3 ft.; at least 250,000,000 cu. ft. having been run off.

It is claimed that the amount of dirt eventually carried out of the cut without cost by the running water will represent a saving of many thousands of dollars over mechanical methods.—Contributed by G. N. Allen, Greeley, Col.

Use a teaspoonful of saltpetre to a pot of glue as a deodorizer, says Wood Craft. It helps the glue to dry faster and become harder. The strength and tenacity is not impaired in any way.

AN UP-TO-DATE ANIMAL HOSPITAL

Modern surgery is now applied as seriously for the cure of animals as for human beings. This illustration shows an interior view of an up-to-date animal hospital. Teeth are treated by regular dentists and objectionable growths removed with as much care as is lavished upon man. A dentist is here shown at work upon a dog's mouth.

Canine Dentistry

LIFTING DEVICE ON ANCIENT CASTLE

This is a photograph of a large wheel yet in existence, which was used in ancient times to raise provisions to one of the castles of Normandy. The

Used for Raising Provisions to a Normandy Castle

castle was so much higher than the surrounding country that some such device was necessary.

Prisoners furnished the required power, two of them running inside the wheel as a dog runs in a coursing wheel, while two more worked the spokes from each side. The rope was carried over a pulley overhead and down to a car which ran up from the level ground on a rude track which had an angle of about 45 deg. The car was large enough to carry a considerable load of provisions.—Contributed by Ellis Ellicott.

CONVEYER BELTS MADE OF STEEL CABLES

Mine owners are now making use of old hoisting cables by taking them apart and making conveyer belts. The accompanying picture shows a steel conveyer belt ½ in. thick, 24 in. wide and 98 ft. long in the course of construction. The old cables are split, taken apart and cleaned. The strands are cut a few feet longer than the length of the belt wanted and placed on a bench and all clamped at one end. All strands are pulled straight with a lever at the other end. The ends are then brought together and a splice made, after which they are reinforced by sewing.

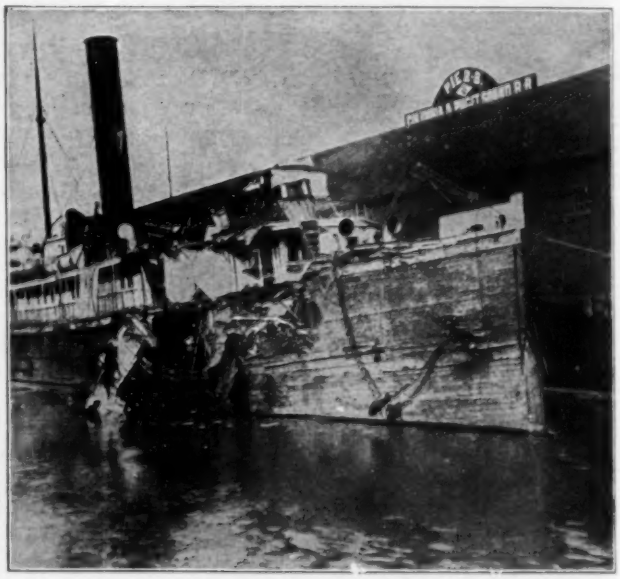
After the splices are all made the strands are laid alternately to the right and left, taking care that no two splices are opposite. They are then joined to-

E. J. Crocker, Victor, Colo., Weaving Wire Belts

gether by sewing back and forth across the width of the belt, using a strand for a thread, and weaving the strands running lengthwise up and down in about the same manner as weaving cloth. Such belts are used in ore houses to convey rock from one part of the building to another. The driving pulley is lagged with wood to prevent slipping.

RESULT OF A STEAMSHIP COLLISION

This hole in the side of the Pacific Coast Steamship Company's liner "Cottage City," was caused by a collision in October with two schooners just off Jefferson Head, Puget Sound. The schooners were being towed by a tug and the "Cottage City's" steering gear failed to work as they were passing. After colliding with the first schooner the "Cottage City" swung around and was struck by the second. All the passengers lost their personal effects, but no one was injured with the exception of three of the crew.



Effect of Two Collisions

COLLECTING LETTERS BY MAGNETISM

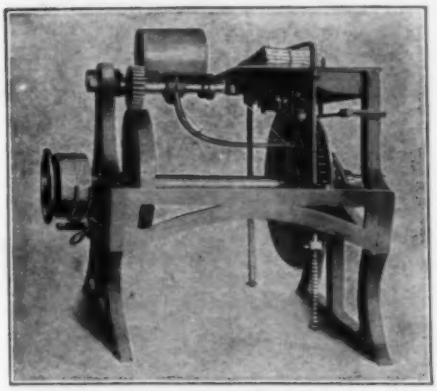
A new electrical apparatus, designed to facilitate the dispatch of letters, has just been installed in the Paris postoffice. It consists of an endless roll of linoleum, 200 ft. in length. This, in revolving, rubs against 32 electric bobbins. When the current is switched on, the linoleum roll descends into the letter box, the contents of which are attracted to it by the electricity received from the bobbins.

As the endless band of linoleum leaves the box the letters are swept from it into a truck which runs on a miniature track through the public room to the sorting office. The saving in time is said to be considerable, and the apparatus is noiseless.

AN AUTOMATIC PACKAGE-TYING MACHINE

This automatic package-tying machine, although designed especially to meet the needs of the postoffice department, is to be fitted with the necessary adjustments for tying commercial packages of various sizes. As shown in the illustration, the machine is designed solely for letter packages of the ordinary size and any thickness up to 3 in., which is the postoffice limit.

The tying operation is not complicated. The cylinder holding the twine and the tying arm are fastened to a shaft, as shown in the illustration, and turn with it. The arm makes two revolutions, thus winding the twine twice around the package. As the arm passes below the table in finishing the first revolution, the presser bar, which holds the package in place, raises, and the package is turned around. This 90-degree turn crosses the string and



Machine Which Ties a Package of Letters in Two Seconds

brings the package in correct position with reference to the knotter, which is placed directly under the table. The twine arm stops and is held rigid through the knotting part of the operation. The table is made in two sections, with a slit between.

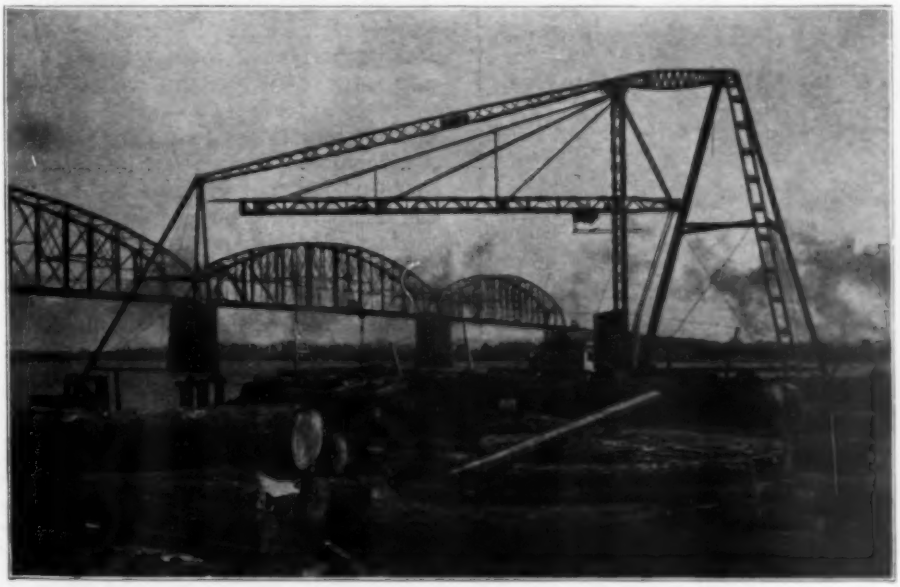
The machine is speeded to two seconds. Making an allowance of three seconds for handling the package and touching a button—which is all the operator will have to do—the time for each package would be five seconds, a saving of 10 seconds over hand tying.

It is claimed that an expert distributer in the Chicago postoffice, having to make a large "tie-out" of, say, 60 packages, will distribute letters up to 15 minutes of the time for the mail to go out. This allows him 15 seconds to tie each package. It is claimed that the machine will tie the 60 packages in five minutes, thus enabling the distributer to enclose a letter dropped in the office 10 minutes later than has hitherto been possible.

AN ELECTRIC CRANE FOR HANDLING LOGS

This electric derrick crane, designed for handling heavy logs, is located on the river bank at St. Louis. It lifts logs from the water and deposits them in neat piles in the lumber yard.

The crane has an effective radius of 75 ft. and a lifting capacity of 5 tons. The electrically driven trolley travels between the latticed girders of the jib, an enclosure being provided for both the operator and mechanism. The derrick is equipped with three direct-current motors which operate the three movements of the crane.



Lifts Logs from River and Piles Them in Lumber Yard

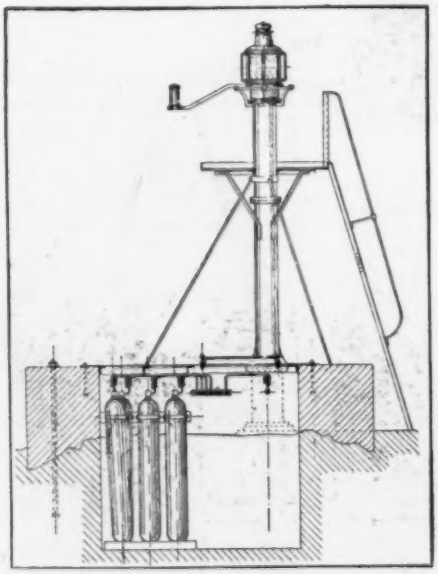
The hoisting speed is 60 to 120 ft. per minute, the traveling speed of the trolley 125 to 150 ft. per minute, and the swinging speed two revolutions per minute. The mast is 60 ft. high.

ACETYLENE LIGHTHOUSES AND BUOYS

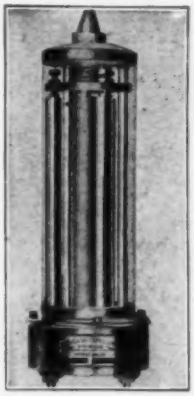
Over One Thousand of Them in Sweden —No Attendants Necessary—Sun Valve Automatically Turns the Gas On and Off

By A. R. Nordvall, Sweden

To supply lighthouses and buoys with an ideal illuminant that will burn for periods up to one year and beyond, without attendance and at a reasonable cost, has been the dream of lighthouse commissioners for many years. Within the last year, however, it has ceased to be a dream, and in Sweden, at least, it has advanced beyond the state of a mere novelty. Acetylene has made the dream practical, and in Sweden, where the system here described originated, over 1,000 lighthouses and buoys have used it for a year, after thorough testing.



Sun Valve at the Left



Sun Valve

Floating Light

The Swedish system is one that depends upon acetylene dissolved in acetone—known in Sweden as acetongas. It was a number of years after this illuminant was placed on the market before it could be satisfactorily utilized in the lighthouse service. The most important of the reasons against it was the difficulties involved in properly characterizing the light so as to fit the requirements of navigation, and the comparatively high cost of producing and supplying the gas.

These difficulties have been thoroughly eliminated by the inventions of Gustav Dalen, a Swedish engineer. The most important of these is the flashing apparatus and the sun valve. The flashing apparatus not only gives a better navigation signal than the constant burning flame, but saves from 50 to 90 per cent of the acetylene, for the reason that no gas is consumed during the dark intervals of the flashlight period.

When short flashes can be used, say, for instance, a flash of 0.3 second duration every third second, 90 per cent of the gas is saved, as compared with continuous burning. Of course the longer the light periods, the less is the saving until a flash period of one-half light and one-half dark is reached, and even then a saving of 50 per cent is obtained.

But it is the sun valve which is the most interesting feature. Even when a considerable quantity of gas is saved

by means of the flashing apparatus, it is still a great waste for the lights to be kept burning during the day when they are not needed; and as the idea of the system is the elimination of light-house keepers or buoy attendants, it was necessary to invent an automatic lighthouse keeper. Experiments proved successful and the result is the sun valve.

The sun valve, or automatic lighthouse keeper, is founded on the well-known principle that a body with a surface that absorbs light will have a higher temperature and thus expand more than a similar body with a surface that reflects the light, when both are exposed to the same light. This difference in expansion operates on a valve which opens or shuts the gas passage to the burner.

The apparatus is very strong and simple, and, according to the Swedish lighthouse commission, absolutely reliable. It is patented the world over, and its installation on European lighthouses and buoys proves that it saves from 30 to 40 per cent of gas. A projecting arm supports the sun valve. Of course, if the day is dark and the sun hidden by clouds or mists, the light burns on, but on such days the signal is as necessary as at night.

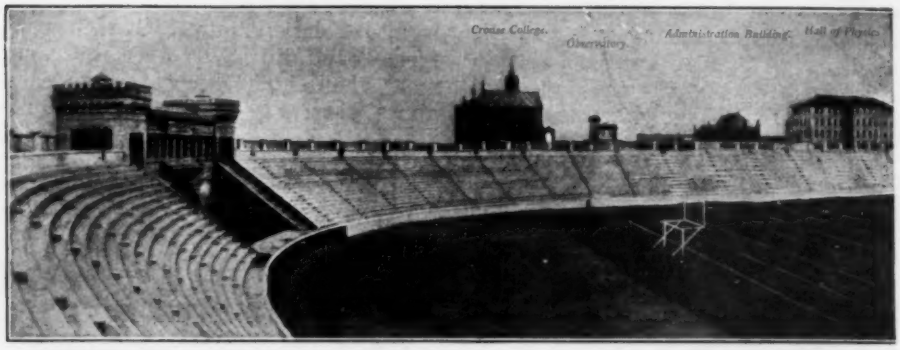
The first cost of such a system for lighthouses, or for the purchase of buoys, even when fitted with gas tanks sufficient for one year's constant service, is by no means higher than that of systems hitherto used, and is, in fact, considerably cheaper when the great storage capacity, reliability, and high illuminating efficiency are taken into consideration. The saving in salaries is also a large figure. Sweden paid from $100 to $300 per year to more than 1,000 keepers now made unnecessary.

STALL-LIKE SLEEPING QUARTERS FOR TUBERCULOSIS PATIENTS

This illustration would without explanation be taken for a neat series of stalls for the housing of thoroughbred horses, but in reality it is one of a number of open sleeping quarters connected with an Ohio tuberculosis institution. The patients sleep in these quarters during the coldest nights in winter. Fresh air is as vital to consumptives as food.

Photo by Howard Wright

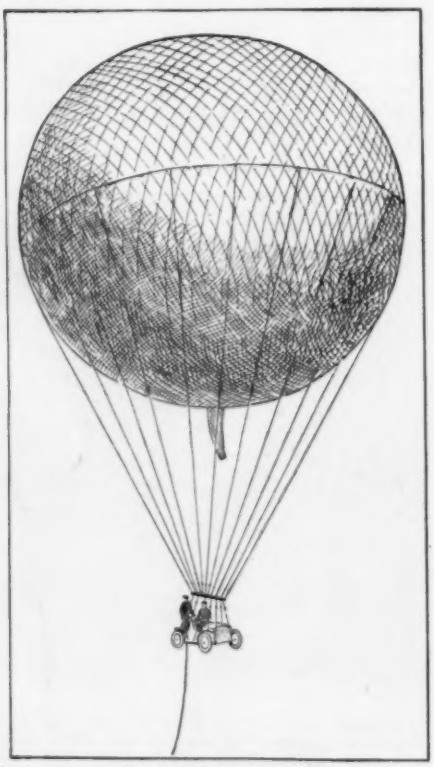
Madam Cat, of Rushville, Ind., is here shown as dressed for formal calls on a clear, but cold winter's afternoon. It is only one of many costumes for many fashionable occasions.



This huge concrete stadium of the Syracuse University, Syracuse, N. Y., with its seating capacity of 35,000, is one of the finest and most up-to-date university athletic fields in the world. The university buildings, including the observatory, administration building,

BALLOON ASCENDS WITH AUTO AS BASKET

A balloon with an automobile as a basket, recently made a successful ascension from Indianapolis, the event probably being the first of its kind in any part of the world. The automobile attached in place of the basket was of the usual roadster type, and quite heavy.

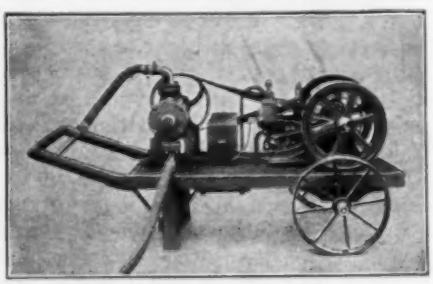


Auto as Balloon Basket

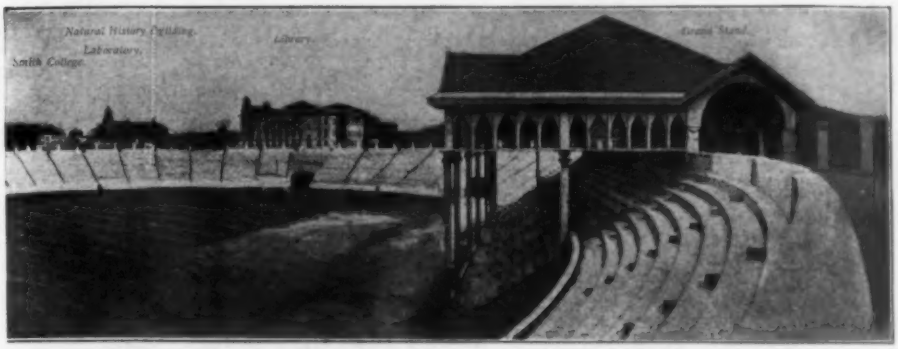
The balloon, thus burdened, rose to an altitude of 2,800 ft. Either because of the fact that there was but little wind, or because of the weight of the automobile, the distance traveled was only 10 miles, although the flight lasted a few minutes less than two hours. When a safe landing had been made, the aeronaut, G. L. Bumbaugh, and his companion returned to Indianapolis in the same automobile they had carried with them through the sky.

A PORTABLE MOTOR WATERWORKS

The portable motor waterworks shown in this illustration was one of the features of the first international agricultural motor exhibition, held during the early fall at Bourges, France. The whole equipment is ar-



Pumps Water for Gardening



laboratory, hall of physics, natural history building, library, Smith College, and Crouse college are all grouped around one side of it.

ranged on a 2-wheeled hand truck, and can easily be moved from one place to another. It pumps water from wells or ponds for gardening purposes.

A REMARKABLE AUTOMATIC MUSICIAN

It is safe to say that this musical automaton, the zither it plays, and all the accouterments, are of an elaborate and artistic nature that would be difficult to surpass. The inventor is C. E. Nixon, a Californian in the U. S. internal revenue service, who has spent several years of his spare time working out his idea as a recreation.

The life-sized figure, costumed in the richest silks and jewels, reclining upon a couch and cushions, with a real African leopard skin about her form, represents the Egyptian goddess "Isis."

The goddess, when wound up, plays upon the zither, either striking the strings separately, or in tremando. The right hand plays the air, while the left hand plays the chords.

The cabinet is of mahogany, carved in Egyptian characters. The actual number of wheels or gears that rotate in the figure and cabinet is 1,187, nearly 300 of which are employed in the breast of the goddess.

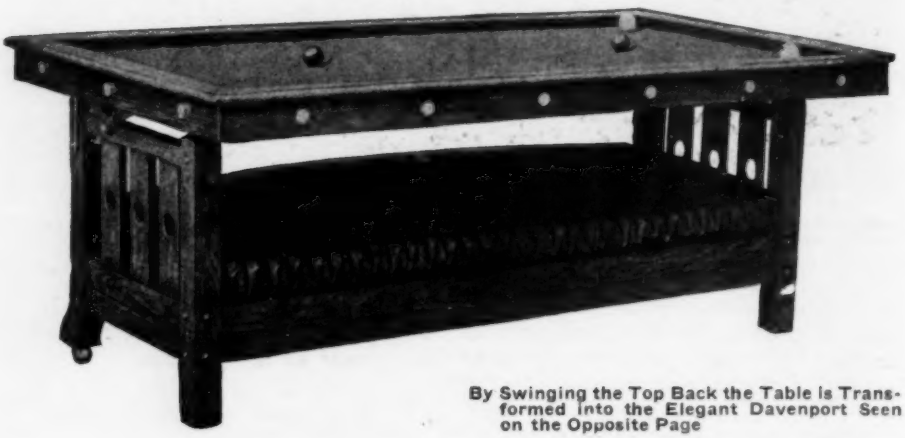
The Goddess Actually Plays the Zither

WALKING 100,000 MILES

One hundred thousand miles on foot is the ambition of George Crosby, an inmate of the National Soldiers' Home at Santa Monica, Cal. So fond of walking is this veteran, that during nearly every day of the year he travels the same road between the Soldiers' Home and Los Angeles and return, a distance of 30 miles.

He will soon celebrate the completion of his 100,000th mile.

HOW TO MAKE A COMBINATION BILLIARD TABLE AND DAVENPORT



By Swinging the Top Back the Table Is Transformed Into the Elegant Davenport Seen on the Opposite Page

A small size billiard table which can be converted quickly into a davenport is made as follows: Secure clear, selected plain sawed white oak in sizes as indicated by the drawing. Have these planed at the mill to the widths and thicknesses specified.

The lower part should be made first. Cut the four posts to length, chamfering the ends somewhat so that they will not splinter when in use. Lay out and cut the mortises which are to receive the rails. The lower rails are to be 1½ in. thick and the mortises are to be laid out in the legs so as to bring their outer surfaces almost flush with those of the posts. The upper rails are 2¼ in. wide. The slats are ¾ in. thick. Tenons should be thoroughly pinned to the sides of the mortises as shown in the illustration. The braces are 1¾ in. thick and are fastened to place with roundhead screws and glue.

The seat may be made by putting in a solid bottom that shall rest upon cleats fastened to the inner surfaces of the rails. The top of this bottom should rest about ¾ in. below the top edge of the rails. A well filled leather cushion completes this part.

A more satisfactory result is obtained by putting in springs and upholstering the seat. Upon this the leather cushion can be placed.

The top or table is built upon and about a heavy frame of well seasoned 1¾-in. by 5¾-in. white pine. The parts to this frame are thoroughly mortised and tenoned together. Middle stretchers, lengthwise and crosswise, give added strength and rigidity. Upon this frame the slate bed is leveled by planing the frame wherever necessary. Slats are fastened to the bed by screws the heads of which are countersunk so that they may be covered over even with plaster of paris.

The top and side facings are built together, the angle being reinforced with block and glue, as shown in detail. These facings, to which the cushions are attached, are afterward made fast to the frame by ornamental headed screws. The detail and photograph show the manner of applying the under facing.

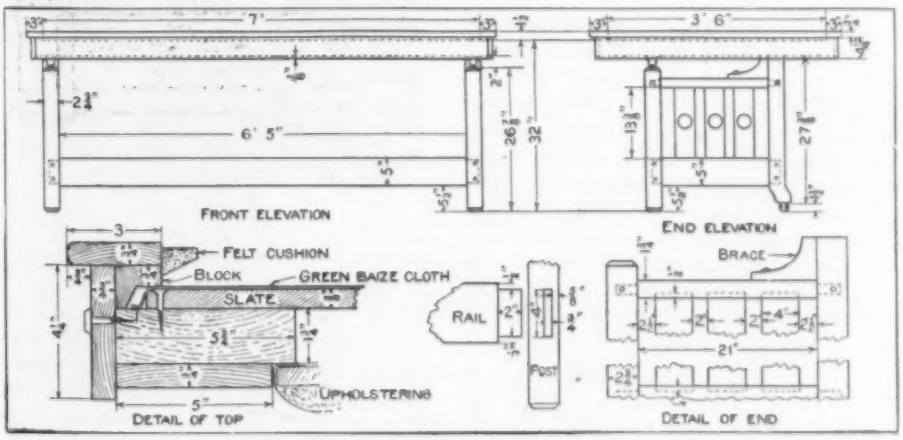
Before attaching the top and side facings, the bed cloth should be placed over the slate and fastened. The nap of the cloth should run from the head toward the opposite end of the table. Draw the cloth as tight as possible, taking care that there shall be no wrinkles.

The Billiard Table as Converted into a Luxurious Davenport—A Child Can Make the Change in a Moment

The billiard cushions can be bought ready to cover. The bumpers which keep the top from striking the front posts can be obtained by making proper selection from oak door bumpers carried in stock by hardware dealers. The brass swing bars, most likely, can be obtained at the same place.

The upholstering on the under side of the top—the back of the davenport—is to be built upon a stout frame made of some suitable common wood, and the whole set in the recess formed as shown in the detail drawing—the whole being fastened from the back before the slate bed is put in position.

Effort should be made to select leather of a color that will harmonize with the wood finish which is to be applied.

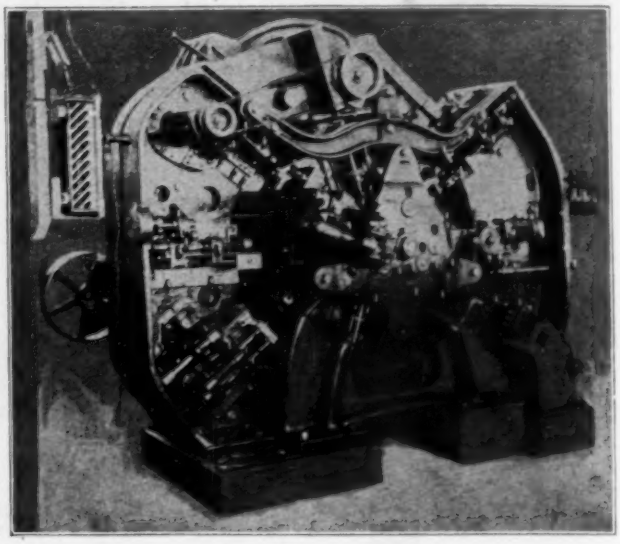


Details Showing Dimensions of Parts

MARVELOUS MACHINE MAKES SEWING MACHINES QUICKLY

A better sewing machine can be purchased today for less than $50 which a few years ago cost the buyer $150, and even $200. Improved machinery for making the various parts is the explanation of the reduction in price.

There has recently been constructed for use in one of the large factories in the East a huge machine to form the bed plates of a sewing machine. This forming machine is automatic in its action and performs 28 operations. It turns out 400 bed plates per day, doing the same work which formerly required the labor of 30 men. A turret holding 10 bed plates revolves around the various tools or shapers. The plain sheet of metal is fed into the top of the machine, and after making one full revolution comes out again at the top a finished piece. Additional machines are being built for use in the company's factories in Russia and Germany.



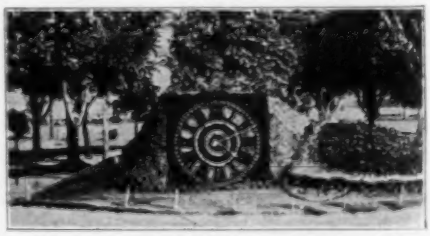
Machine for Forming the Bed Plates

AN ELECTRIC-LIGHT FIRE ALARM SYSTEM

The town of Avalon, Pa., has a novel as well as highly satisfactory fire alarm system composed of electric-light signals. The town is situated on both sides of a hill, along the top of which runs the main street. The town hall is located on the highest rise of the hill, and on its top is a 50-ft. steel pole, at the tip of which are a set of red, white, and green electric lamps, of 50 cp. each. When an alarm of fire is received, a switch is thrown which rings a bell on the top of the building and throws on the lights. The red light is shown if the fire is on one side of the hill, and the green light if it is on the other. The white light is displayed when the alarm is false or the fire out.

THE FLORIST AS A MAKER OF CLOCK CASES

This clock is situated in Waterworks Park, Detroit, Mich. Its face and case are made of different kinds of flowers. The clockwork is operated by electricity. The parks of the American cities



All Made of Flowers

open a wonderful field for the genius of the florist.

A coal handling plant, which contains a novel device to pick up a small coal boat, elevate it about 60 ft. in the air, and turn it upside down to discharge the coal, is being erected in Buffalo.

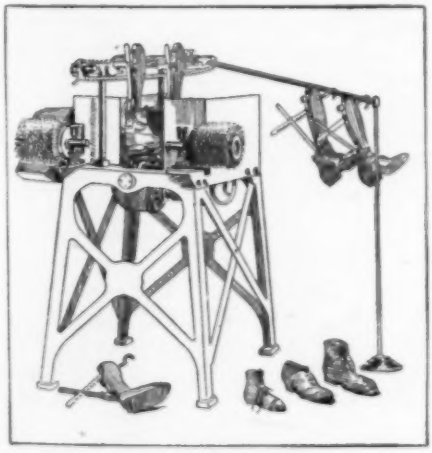
CONVENIENT BASKET FOR TRANSPLANTING PLANTS

This simple and easily handled transplanting basket is a great convenience in transplanting young trees, shrubs, ornamental growths and flowering vegetable plants. It is made of galvanized wire, and as it is constructed in two halves exactly alike is easily put together and taken apart as convenient.

It is claimed that plants grow as well in it as when turned out of it, and that its use as a hanging basket is most convenient. The illustration shows a musk melon plant in a 4-in. basket ready for transplanting.

A MECHANICAL SHOE POLISHER

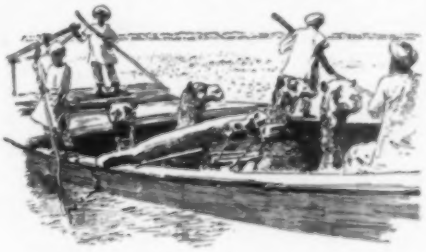
The German bootblack has a serious competitor in the recently invented automatic shoe polisher shown in this illustration. It is especially devised for use in hotels and other places where shoes are polished in large quantities, and is claimed to do the work with great rapidity and excellence. The shoes are placed on the specially devised shoe horns shown in the illustration and run through the brushes. One of these does the cleaning and the other the polishing. When the job is completed the shoe horns are deposited on a rod by a chain conveyer.

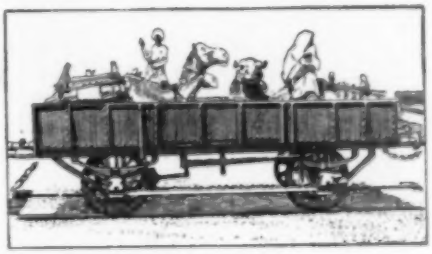


Rapid Shoe Polisher

TRANSPORTING CAMELS OVER LAND AND WATER

That the camel, which is known as the ship of the desert, has sometimes to be transported in other ships, is shown in one of these illustrations. In crossing the Indus river, the camels walk peaceably into the flat-bottomed boats, lie down, and with scarcely any looking after are punted across. The second illustration shows a number of camels being transported in steel cars of the type used on the Indian railways.





Transporting Camels

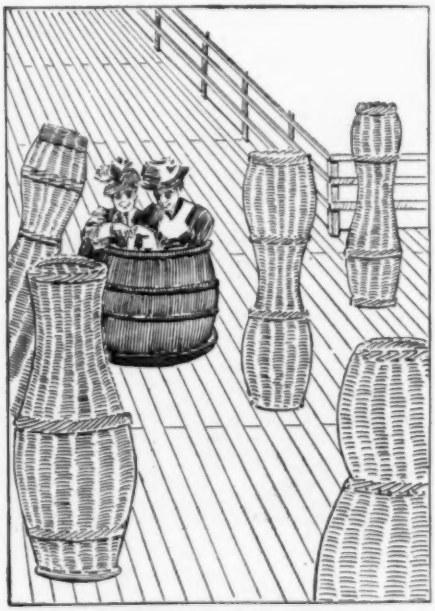
NEW MOTOR BOAT RULES

The new government rules for the navigation of motor boats provide that no person shall receive an original license as a motor-boat engineer of boats above 15 gross tons, carrying

freight or passengers for hire, without first having served at least one year on motor boats, or in the engineer's department of a steam vessel. A person who has had two years' experience in the construction of marine motor engines is also eligible for such a license.

A GAME OF HUMAN NINEPINS

The most popular sport in Munich at the present time is the game of human ninepins, and the citizens of that



"The Pins Are Giant Wicker Baskets"

happy-go-lucky Bavarian city indulge in the sport in such manner as to indicate they are enthusiastic over it.

The pins are nothing more nor less than giant wicker baskets set at the foot of an incline. The bowls are also baskets, and in them one or two adults or several children may squat as the bowls slide down toward the pins, knocking them down or sliding past them, as the case may be.

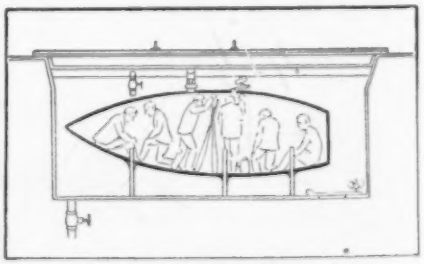
This game of "living skittles" is just as much fun for the crowds who surround the incline as it is for the jolly players. The onrushing bowls, with their human freight convulsed with laughter, slide in a wabbly fashion as they approach the huge wicker pins.

A LIFEBOAT FOR SUBMARINES

The greatest danger in submarine navigation is the ever-present possibility that because of some complication the vessel will not rise to the surface. A number of such accidents have already occurred, causing the death of the men entombed, but if the device here shown proves practical such danger will be eliminated.

It is the invention of an engineer in Washington, D. C., and consists of a lifeboat for submarines and an arrangement by which it can be carried. The first provision is a water-tight compartment situated in the upper portion of the center of the submarine. In the upper part of the hull, or deck, of the submarine, just over the compartment, is a set of hatches or doors which open outward. Supported on a suitable frame within the compartment is a lifeboat. The boat is entirely enclosed and water-tight, a small trap-door in the top providing admittance.

If, for any reason, the submarine fails to rise, the crew enter the compartment through a lower hatchway and close it after them. The crew then enter the lifeboat, the last man unscrewing the bolts which lock the hatches leading from the compartment to the open water. He also opens the flooding valves before pulling shut and securely locking the trap-door of the lifeboat. The flooding of the compartment floats the lifeboat and also over-

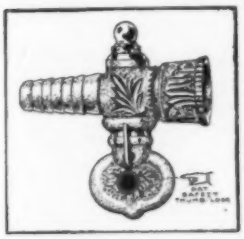


Crew in Submarine Lifeboat

comes the pressure of the water without. The lifeboat, being filled with air, naturally rises, pushing the hinged hatches upward far enough to permit it to pass freely.

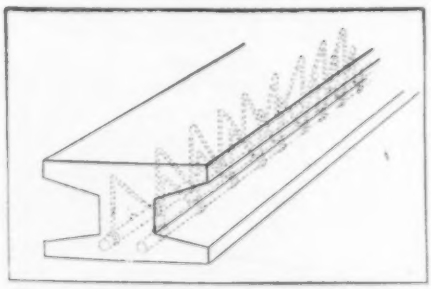
A SAFETY GAS COCK

Accidental asphyxiation from a gas jet is made impossible by the safety gas cock shown in this illustration. It is not only accident proof but "fool-proof." The whole operation is to press the little trigger with the thumb and then turn the cock, thus opening the gas passage. In shutting off the gas the cock is simply turned in the usual way and the trigger automatically slides into place and locks it closed. The cock cannot be opened by accident or any other cause without first pressing the trigger.



NEW SYSTEM OF FIREPROOF FLOOR CONSTRUCTION

The system of fireproof floor construction here illustrated consists of a series of portable reinforced sections or units made in the shape of an exaggerated I-beam with wide flanges and a short web. These sections are cast on the ground in specially prepared moulds and are placed in the building with flanges touching, thus forming a complete surface to receive finishing coats for both floor and ceiling.



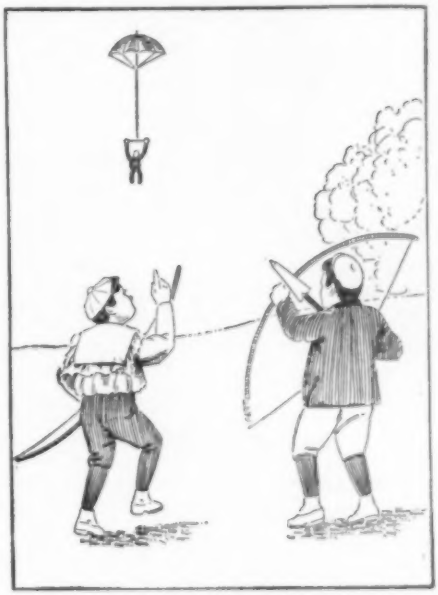
Like an Exaggerated I-Beam

The great advantage claimed for this system is that architects and owners are given every opportunity to test these joints before they go into the building. It does away with all centering and staging and saves time, as the space under the floor or ceiling is entirely unobstructed and the interior work can be commenced as soon as the floor is laid.

The architect orders a complete reinforced concrete floor as easily as he would order a load of brick.

THE PARACHUTE ARROW

An inventor, with a keen desire for the pleasure of boys and girls as well as a conception of the advertising possibilities of his idea, has devised a parachute arrow which cannot help but appeal to the young and old alike.



For Amusement and Advertising Purposes

It is a combined parachute and arrow. From a drawn bow the arrow takes its flight up into the air until its force is spent, then the parachute opens, the wooden figure of an aeronaut, or

any suitable article of an advertising or simply a weighty nature, drops into position and descends gently to the ground.

Aside from the great amusement it offers is its advertising value. The moment it is seen it creates interest. Advertising can be printed on both the parachute and the aeronaut.

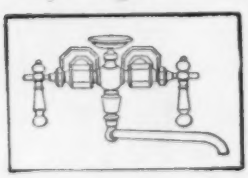
BABY REACHES SUMMIT OF ALPINE PEAK

The most extraordinary ascent ever recorded in the Alps was recently made by a six-months-old baby, who was carried up the peaks strapped on the back of a guide. The baby is the son of an enthusiastic Alpine climber from Cannes.

The Youngest Mountain Climber

AN EXTENSION FAUCET

By using the extension faucet shown in this illustration the necessity of lifting pails or pans into the sink to fill them with water is done away with. The one faucet furnishes cold or hot water, and swings over both the basin and the drain board.



WHY AMERICA MUST HAVE AIRSHIPS

Brig. Gen. Allen, chief of the signal corps of the United States army, believes that the United States must have airships and that a demand for $1,000,000 is conservative.

"Congress ought to appropriate at least $1,000,000 for military aeronautic purposes," says Gen. Allen. "Such a demand would have seemed ridiculous, even so short a time as a year ago, but in view of the incredible progress which has occurred both in the realm of dirigible airships and heavier-than-air flying machines, I think such an appropriation reasonable and justifiable.

"If such a fund was placed at our disposal it would enable us to keep well in the forefront, like Germany, France, and England. These countries are devoting vast amounts of time, energy and money to the development of the aerial arm of their naval and military establishments.

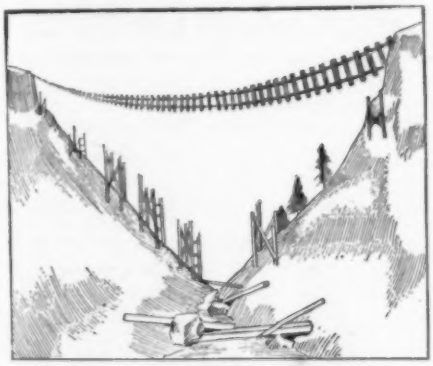
"There is no doubt that the popular mind in America, thanks to the exhaustive attention our magazines and newspapers are now giving aerial navigation, has become thoroughly interested in the subject. I believe the influential body of public opinion favors providing the war department with the money necessary to use in the continued comprehensive experiments, the purchase of equipment, etc. Germany, supposedly a stolid nation of philosophers and plodding business men, seems wholly obsessed with airship enthusiasm, and popular national subscriptions, which reach nearly $2,000,000, have been raised for Count Zeppelin. This is not only absolutely without parallel in German history but illustrates how deep seated is the conviction that the conquest of the air means a mighty addition to Germany's defensive and offensive powers.

"Our political and geographical posi-

tion differs materially from that of Germany, but we cannot afford to neglect keeping abreast of the times in respect to aerial navigation any more than we can afford to neglect to equip ourselves with wireless telegraphy and other technical improvements of the age."

RAILROAD TRACK AND TIES LEFT HANGING OVER A RAVINE

A recent cloudburst near Telluride, Col., swept all the supporting work of these tracks away, leaving the rails and ties suspended over a deep gulch. Nearly 200 ft. of track was thus left suspended, and only the timely discovery of the washout prevented a Denver



A Suspended Railroad

& Rio Grande railroad train from running into the gulch.

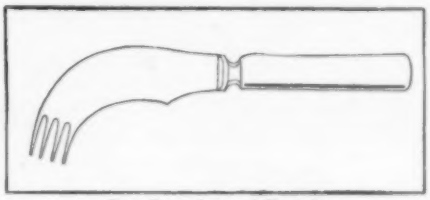
A MOON-DIAL CLOCK

The world is familiar with sun dials, and has been for ages, but it is doubtful if many people have ever heard of a "moon dial." Such a device is still to be seen on an old church in Norfolkshire, England, where it was placed in 1687.

The name "moon dial," however, is somewhat misleading, as the shadow cast by the light of the moon had nothing to do with it. The dial on the church was attached to the tower clock by which it was operated, and the portion of white disk representing the moon was visible through an opening in the dial. It was so placed as to be visible from the harbor, enabling the mariners to see at a glance the age of the moon and the time of day.

COMBINED KNIFE AND FORK FOR ONE-ARMED PEOPLE

The ever increasing number of one-armed men in the United States has

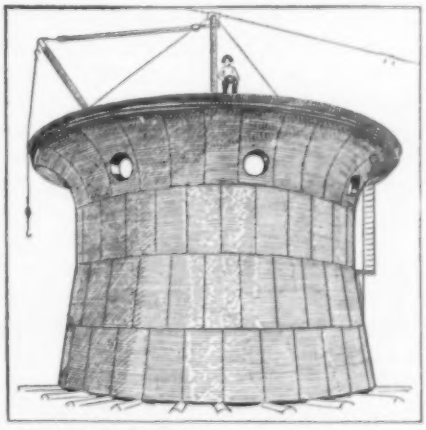


For One-Armed People

made this novelty in cutlery quite profitable. It is a combination knife and fork and a little practice makes its use very satisfactory, it is claimed.

STEEL SUB-STRUCTURE FOR LIGHTHOUSES

Along the Atlantic coast, particularly in New England territory, this type of lighthouse construction is much in evidence. The sub-structure is built entirely of cast-iron plating, the plates being flanged inwardly and bolted together, a slight shoulder on the extreme edge of each flange forming a

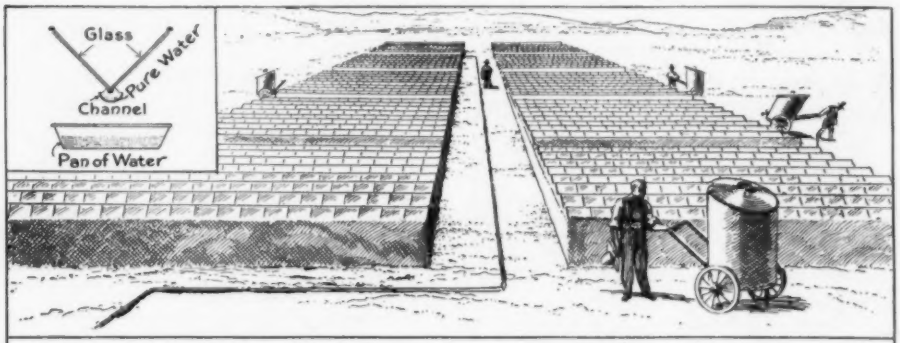


Courtesy Marine Review

A New England Type of Lighthouse

space into which suitable material may be calked. The interior is filled with concrete.

This sub-structure is 42 ft. in height and 40 ft. in diameter at the top, and is composed of 294 plates, with a total weight of 321,000 lb. It was erected at Delaware Bay, N. J.



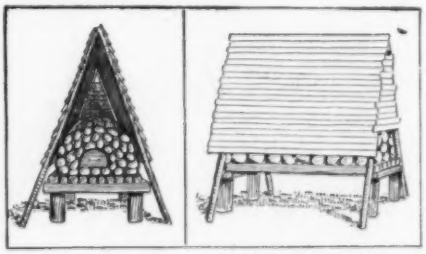
Making Pure Water on the Chilean Desert

In the big desert of Chile there is a considerable amount of brackish water, but no water that either human beings or stock can drink. Science, however, has come to the aid of this rainless section of the country in the form of an ingenious desert waterworks consisting of a series of frames containing 20,000 sq. ft. of glass. The panes of glass are arranged in the shape of a V, and under each pane is a shallow pan containing brackish water. The heat of the sun evaporates the water, which condenses upon the sloping glass, and, made pure by this operation, it runs down into little channels at the bottom of the V, and is carried away into the main canal. Nearly 1,000 gal. of fresh water is collected daily by this means.

FRENCH CANADIAN BREAD OVEN

There is probably no civilized section in North America less advanced in many ways than the part of Canada most thickly settled with French-Canadians. The baking oven shown in this illustration is of the type used a hundred and more years ago, yet hundreds of them are still being used in the province of Quebec.

The oven is constructed of cobblestones and clay on a raised foundation or platform, the whole being roofed over as shown in the illustration. The fire is put in the oven and left until the interior is hot enough to run the weekly batch of bread through.



Courtesy Baker's Helper

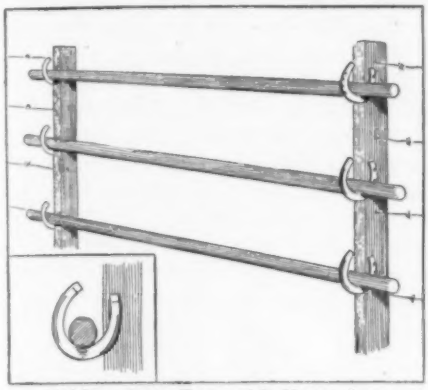
Baking Oven Used in Canada

On one of the recent trips of the trans-Atlantic liner "Kaiser Wilhelm II," Plymouth was approached in a dense fog. By the aid of the wireless equipment arrangements were made for whistle signals from land to guide the ship through. Tenders were called, passengers, mail and baggage were landed, and the ship proceeded to Cherbourg without even seeing Plymouth.

SHOP NOTES

Quickly Made Gate

The accompanying sketch shows how to construct a gate for temporary or

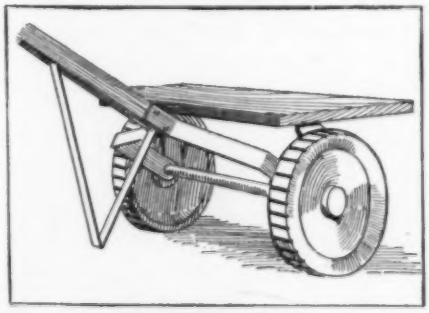


Holding Gate Bars with Horseshoes

permanent use. Several old horseshoes and some poles are all that are necessary for this gate. The horseshoes are nailed to the posts as shown in the small sketch. Where a temporary gate is necessary the shoes can be put on quickly and also removed without much trouble when the gate has served its purpose.

Truck Made from an Old Lawn Mower

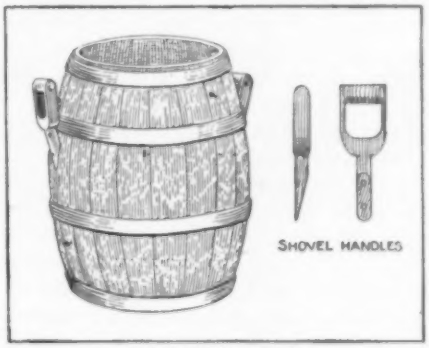
Having a useless old lawn mower, I took the machine apart, which was readily done, removing the rotary knives, also the blade from the cutter bar and turned the mower over. This gave me a strong cross bar with bolt holes in it, to which I bolted a platform. Then a piece of heavy flat iron was bent and fastened to the under side of the handle, making a rest to keep the truck upright when not in motion. This makes a strong, low down truck, which will handle a stove or other heavy article with ease.—Contributed by E. E. Palmer, Long Beach, Cal.



Lawn Mower Truck

Handles for a Water Barrel

Seeing a couple of railroad laborers carrying a barrel of water between them clearly demonstrated that necessity is



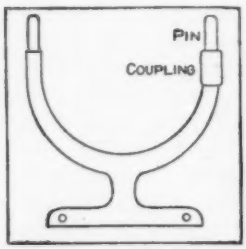
For Carrying Water

the mother of invention. A closer investigation showed that they had made use of the handles from two broken shovels. The handles were cut to the proper length and trimmed on an angle as shown in the sketch. These handles were then fastened to the sides of the barrel opposite each other with large screws.—Contributed by I. G. Bayley, Cape May Point, N. J.

When turning or drilling aluminum use kerosene oil on the cutting edge.

Repairing an Automobile Lamp Bracket

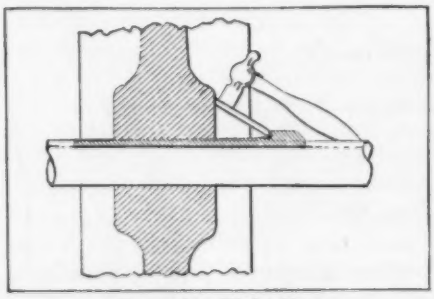
Cut a ¼-in. pipe thread on the end of the broken shank and screw a pipe coupling on this thread. Fit a ½-in. round pin in the open end of the coupling and file it to fit the socket in the lamp. This will make a good job in a short time and the work can be done at any first-class plumbing or blacksmith shop.



How to Draw a Tight Key

Herewith is shown a simple and effective method of drawing a tight key. Take a piece of steel about the width of the key and cut it a little longer than the distance from the hub to the head of the key. Bevel the ends and place one end against the hub and the other against the head of the key, as shown. Drive the end down next the hub with a heavy hammer.

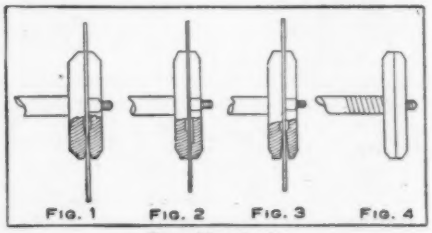
Sometimes the key cannot be driven out from the inserted end, and if it can, the end will be swelled and cause it to drive hard all the way and necessitate the dressing of the key before using again, says Power. If the key has been driven in close, shorter pieces will be required, and as the key comes out it can be followed up with longer ones. If the key has no head on the end, cut or file a notch for the piece of steel.



Removing Tight Key

Some Circular Saw Troubles

The most trouble with circular saws comes from the arbors. In Fig. 1 is shown the condition some arbors are allowed to get into by careless workmen. While this is exaggerated to bring out the point, nevertheless it is true of some mandrels on large, thin saws, and of course makes the saw work badly, says the Wood-Worker. Another condition in which mandrels are found is shown in Fig. 2. This is caused by those having the saws in charge not understanding the importance of giving them the best care. The worst condition a saw arbor can get in is shown in Fig. 3. This will cause a new saw "to walk all around," as it is called by saw men. The collar beyond the touching point



Saw Mandrels

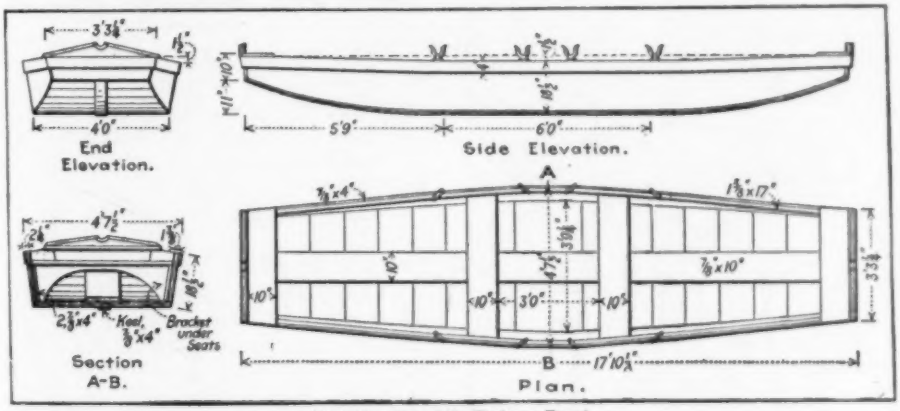
is useless and the collar bearing too small, especially so on a thin saw that is running too slow. Saw collars and arbors should in all cases be fitted and made by careful workmen, who understand something of the duty of the circular saw and the effects of wrong construction of the collars or poor fitting of the journal boxes. Many arbors have to work under trying conditions, having a very tight belt on one side and the pressure of the lumber against the saw in the opposite direction, making the condition a very severe one. Saw tables that are made of wood do not always receive the care they should. An arbor having separate bearings and a poorly-made frame puts the bearings out of line and causes endless trouble. This is one strong point in favor of the solid arbor bearings for small mandrels. In many cases the bearing next the saw causes much trouble. This bearing

running badly will generate heat and in turn expand the collar and the center of the saw, and then we have a saw that will not work good. In babbitting these arbors it is well to wrap the bearing with a sheet of paper and wind a cord spirally around the paper, as shown in Fig. 4, before placing in the box preparatory to pouring in the melted metal.

How to Make a Pile Driver Punt

An ordinary punt for pile driver service is such a common appurtenance that it seems unnecessary to give plans for building them. However, a builder will have many doubts as to the best relations of length, depth and beam. The punt as described was designed to have the proper proportions and to give the best possible results. If the punts are made a few inches wider there will be difficulty in propelling and controlling them in swift water. If, on the other hand, they are made but a few inches narrower their capacity and stability would be much less. This particular punt will be found very stable, and a man may step on the side with no danger of capsizing, says a correspondent of Engineering News. A large number of men can be carried to and from the work in each punt.

The material used may be white pine, spruce or western cedar. The bottom boards should be nailed to the sides with 4-in. wrought spikes with large heads, putting at least four nails at each end of each bottom board, holes to be bored for the nails with a bit slightly smaller than the spikes, so as to prevent any checking or splitting of the wood in driving the spikes. All seams should be carefully calked with oakum and then pitched over with a proper mixture of tar and tallow applied hot. The bottom board, which is 10 in. wide, should next be put into place, the punt being turned bottom up for that purpose, so as to admit of a man going underneath it to clinch



Details of a Pile Driver Punt

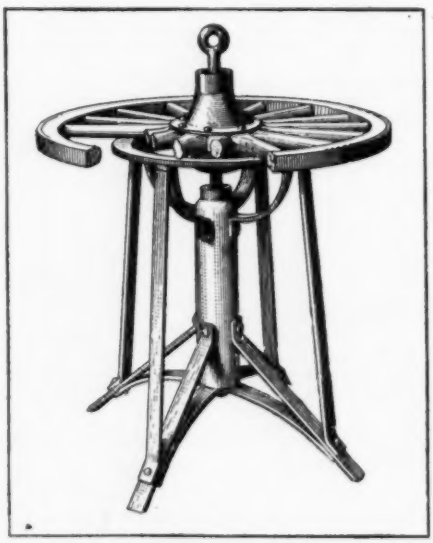
the spikes. The keel then is to be nailed through the bottom of the punt and clinched to the bottom board, with 4-in. wrought nails. Steel wire nails should not be substituted wherever wrought nails or spikes are specified.

The regular heavy size of row locks will be found best, although thole pins if properly made out of hardwood are perhaps better than the cast rowlocks. There are some disadvantages in using thole pins, as they are liable to get broken by violent contact with the pile driver or scows, and it takes a longer time to replace them than to put in a new rowlock. In case rowlocks are used care should be taken that the blocks for them are thoroughly well fastened to the punt. It will not do to fasten these in with screws, as is the usual practice in lighter boats. The ordinary

holes for the screws should be reamed out so as to admit of the use of a ⅜-in. machine bolt which may be fastened to the side of the boat by a blind nut and washer, the hole for the blind nut afterwards being neatly plugged. The punt should first receive a priming coat of white lead and oil and after that two coats of paint of any color desired.

Home-Made Wheel Jack

The wheel jack as shown in the illustration was originally designed for buggy wheels, but can be used with convenience for large wagon wheels, says a correspondent of Blacksmith and Wheelwright. The pin inserted through the hub of the wheel is used when drilling holes for tire bolts into the felloe, which will save the breakage of drills. The wheel can be turned on the pin with ease. Simplicity of construction is shown by the sketch. The large centerpiece is made from maple, rounded to 4 in. in diameter. The top end is tapered and rounded similar to a wagon wheel hub and a band shrunk on the end to guard against splitting when driving tire bolts. The entire frame is made from old buggy tires and secured at the joints with $\frac{5}{16}$-in. rivets. The bottom braces are fastened to the lower end of the maple centerpiece with a lag screw. The ring at the top on which the wheel lays is made from ¼-by ½-in. iron and the vertical and radial braces are secured with countersunk rivets. The braces are bolted to the centerpiece also with $\frac{5}{16}$-in. carriage bolts. A ¾-in. pipe is fitted into the top end of the maple centerpiece to receive the pin used in the hub of the wheel.



Stand to Hold Buggy Wheels

Plating Over Scratches or Cracks

Many persons consider the process of electroplating the same as that of soldering or painting, where a liquid material is applied to the surface and all scratches, cracks, holes or similar imperfections are covered up. Imperfections will not be covered up by electroplating, but, on the contrary, they will frequently become larger.

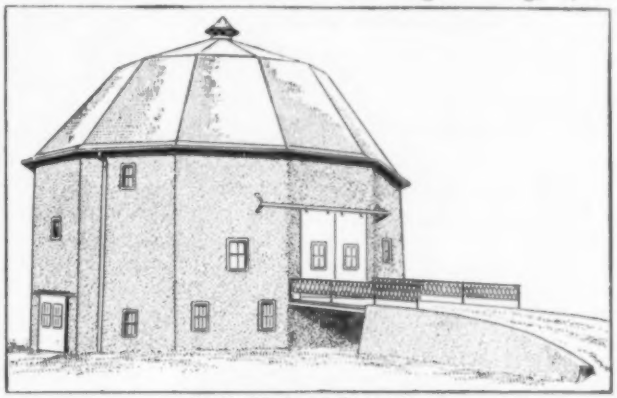
The explanation of this fact is that the deposit faithfully follows the outline of a scratch or crack in the metal, and, even under the microscope, it will be found that every little detail has been actually reproduced. This may be given a trial by making a deep scratch in the surface of a piece of sheet brass and attempting to cover up by depositing upon it an acid copper solution. As it goes on it will be found that the scratch really appears larger than smaller.

The same is true of a joint composed of two pieces of metal. No matter how tight this may be, the two pieces of metal will not become joined by the deposit, says the Brass World. It is impossible to "solder" them together by depositing a thick coating of metal on them.

The preceding facts are of great importance in polishing metal. They serve to indicate that, in order to obtain a good surface on electroplated metal, that of the base metal must be free from all imperfections. Imperfections cannot be removed by plating.

A Concrete Barn

This twelve-sided barn, as shown in the illustration, was built of reinforced concrete at a cost of about $1,800. About 150 loads of gravel and 300 barrels of cement were used in the construction of the barn. Each side is 16 ft. long and 30 ft. from the ground floor to the base of the roof. The walls were reinforced with heavy wire fencing; this required 118 rods of the fencing. Old iron, such as bridge iron, was used for reinforcing around the windows and doors.



Walls Made of Concrete

The foundation was made 3½ ft. wide at the bottom and tapering from both sides to 12 in. at the surface of the ground. This foundation was made from a mixture of 1 part cement to 6 parts of sand and stones tamped in when the mixture was placed in the molds. The walls were made from a mixture of 1 part cement and 5 parts sand and gravel. The lower one-third of the walls is 12 in.; the next one-third 10 in. and the upper one-third 8 in. thick.

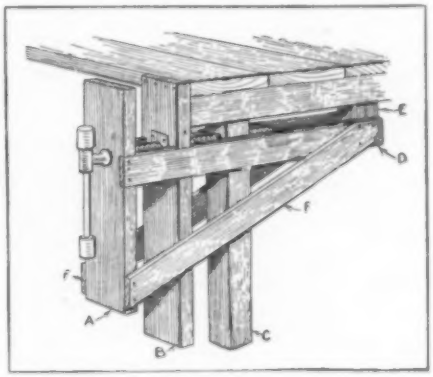
The roof is self-supporting, the walls being specially built to withstand the outward pressure. The roof is covered with felt roofing and coated with cement. The forms used were made of 2- by 10-in. hemlock plank. The work of mixing concrete, hoisting and lifting the forms was done by a gasoline engine with a double drum hoist, one cable drawing the materials to the mixer and the others operating the crane. The crane was made on a center pole 64 ft. high.

The barn is equipped with all modern conveniences for taking care of hay and grain and saving of labor in caring for stock.—Contributed by R. Hagerty, White Pigeon, Mich.

One pound of air contains 13.82 cubic feet.

A Parallel Bench Vise

Herewith is given a sketch showing the construction of a parallel vise for carpenters. The jaws of the vise, A and B, are made from 2- by 6-in. material of the right length for the bench. A hole is bored through the leg, C, of the bench to make a guide for the screw. This hole should be of such a size to make a close fit for the screw. Two pieces of 1 by 3-in. material, D, are mortised into the jaw, A, and fastened with screws, and also loose mortises are cut in the stationary jaw, B, to allow the pieces, D, to slide freely. These two sliding pieces, D, should be longer than the screw. The block, E, is 4 by 4 in. square and 6 in. long and fastened between the ends, D. The uppper end of this block should be smooth for sliding along the under side

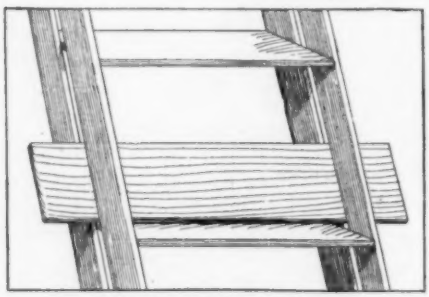


Carpenter's Bench Vise

of the bench support. Two braces, FF, are fastened diagonally from the lower end of the jaw, A, to the sides of the block, E, and over the pieces, D. The screw is an ordinary vise screw that can be purchased at almost any hardware store.

A Step Ladder Kink

When a person is doing work on a ceiling—washing, papering or painting—there are times when one step of the

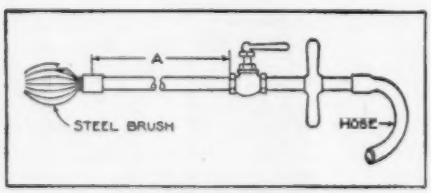


Raising a Step Higher

ladder is either too low or too high to make the distance the proper height to work with ease. Take a piece of board, 4, 5 or 6 in. in width and place it in the ladder, as shown in the sketch, and save the trouble of looking for bricks or pieces of scantling to pile under the plank. In blocking up a board in the usual manner the blocks are liable to tumble out and cause injury to the workman falling from the board.—Contributed by Chas. W. Thiede, Leadville, Colorado.

Removing Scale in Flues with Steam

The accompanying sketch shows the construction of a scale remover which is used for blowing out scale with steam. The device is made from ½-in. pipe, connected as shown, with the length A as long as the tube of the boiler, says Practical Engineer. The pipe is connected with steam hose to a live steam pipe and used when the boiler is under pressure.



For Cleaning Flues

Making a Steel Blue Color Over Nickel

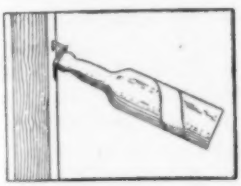
By the use of the well-known hyposulphite of soda and acetate of lead dip it is possible to obtain a blue color on all metals by simple immersion. This dip is used for producing a blue color on metals to imitate a blued steel. If well done, the effect is excellent and almost exactly resembles steel blued by heat, says the Brass World.

Although the blue color can be used on all metals, it is particularly good on work that has been nickeled. The white luster of the nickel gives an excellent base for the blue film, and when it is thus used the color is very vivid. If the blue color is to be put upon nickel which is not to be buffed it is preferable to carry on the operation immediately after the nickel has been deposited in order to avoid staining or tarnishing. If put on the buffed nickel, as it usually is, great care must be used in cleaning, as the blue dip will not "take" over grease. For this reason it is preferable to buff the nickel with rouge, as it is more readily cleaned from the nickel and does not contain as much mineral oils as Vienna lime.

For the sake of those who are not familiar with the dip used for bluing let it be said that it consists of 4 oz. of hyposulphite of soda (hypo) and 4 oz. of sugar of lead (acetate of lead) dissolved in 1 gal. of water. The solution is used boiling hot and the work immersed in it. The color is at first yellow, then purple and finally blue. When it reaches this condition the work should be rinsed and dried. It must then be lacquered or it will fade. The lacquer, however, protects it so that it will hold its color for many years.

Handy Way to Open Crown Corked Bottles

Drive a nail into a wall or post and bend the nail down as shown in the sketch. Hook the edge of the crown cork under the nail head and pull down on the bottle. This will easily open all crown corked bottles where a bottle opener is not available.—Contributed by Charles W. Thiede, Leadville, Colo.

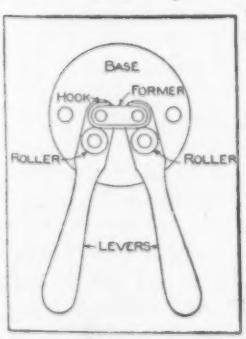


Red Lights Seen Farther Than Green

Red lights have been proved to be visible to a greater distance than green, says International Railway Journal. In recent tests on a clear, dark night, a red light of 1 cp. was clearly discernible at 1 mile; one of 3 cp. at 2 miles; 10 cp., through a binocular, at 4 miles; and 33 cp. at 5 miles. On an exceptionally clear night, a white light of 3.2 cp. could be distinguished at 3 miles; 17.2 cp. at 5 miles.

Home-Made Belt Hook Former

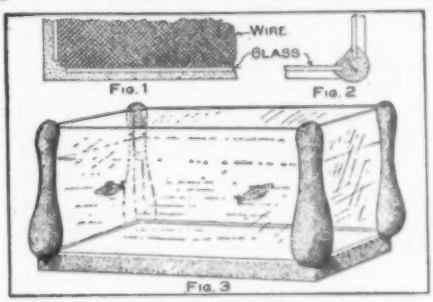
Factories using sewing and other machines that are run by power and driven by round leather belts, purchase their belt hooks, which amounts to no small sum during the year. The sketch herewith shows a home-made device that is used in such a factory for making their own belt hooks. The device consists of a metal base on which are mounted two levers pivoted at the proper distance apart for the length of the hook to be made. A roller is riveted to each lever which turns the half-circle of wire on the end of the former to which that lever is attached. The hooks are made from common coppered wire about No. 12 size.—Contributed by E. G. Barger, Portland, Ore.



How to Make a Concrete Aquarium

A very artistic and durable aquarium can be made of reinforced concrete and glass, as shown in the sketch.

Secure four pieces of glass, plate glass preferred, the desired size to make a tank, say about 9 in. wide, 12 in. long and 10 in. deep. Set the edges of the glass in a concrete base made about 1 in. thick. This can be done in a temporary wooden mold. Use good Portland cement in making and take equal parts cement and clean sharp sand mixed to the consistency of thin dough. Reinforce the base by putting in a wire screen, Fig. 1, turning up the edges so the glass will rest firmly against the screen. Allow about $\frac{1}{4}$ in. open space between the perpendicular edges of the glass. After the cement has set about 48 hours, mold the corners in any design desired, reinforcing them with wire, screws or nails, as shown in Fig. 2, also filling up the inside corners about $\frac{1}{4}$ in. thick. Allow this to set for a day, after which paint the concrete with pure cement and water mixed to the consistency of paint. Put a thick coat of this cement paint on the inside bottom. After two or three days the aquarium will hold water perfectly.



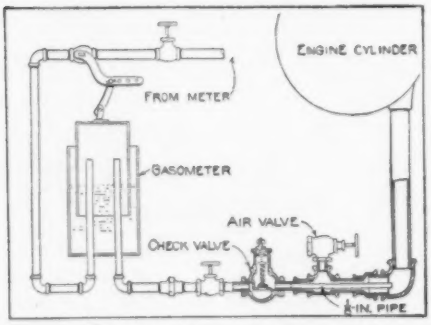
Concrete and Glass

The cement can be painted, enameled or bronzed as desired, also a brass or wooden cover fitted to the upper edges of the glass.—Contributed by S. O. Safholm, Minneapolis, Minn.

Using Manufactured or Natural Gas in Gasoline Engines

(Condensed from Gas Power.)

As gasoline engines are furnished with carbureters for using gasoline the connections are not suitable to use gas. When changing from gasoline to manufactured or natural gas the connections and carbureter must be changed and a gas bag inserted in the main pipe. Herewith is illustrated a home-made carbureter, connections and a device to use instead of a gas bag. The diagram



Gas Carbureter and Gasometer

and dimensions are for a 2½-hp. horizontal engine.

Beginning with the opening from the inlet valve on the engine 1-in. pipe is used to make the connections to the point where the reducer is shown in the sketch. From the reducer a ¾-in. nipple connects a ¾-in. tee. On the side outlet of this tee a short nipple connects a globe valve which is used as an air valve and when set to admit the proper amount of air it remains untouched in future use. Into the open end of the ¾-in. tee is screwed a ¾- by ⅜-in. bushing, thus reducing the other connections from this point on to ⅜ in.

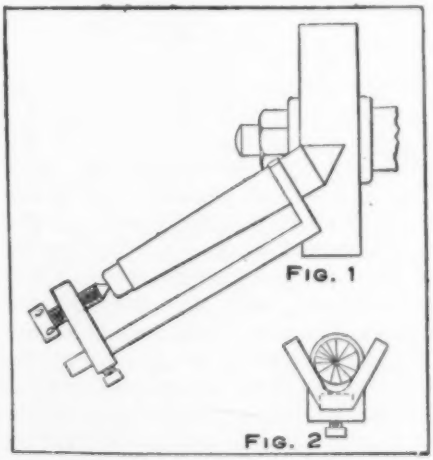
The small pipe passing through the ¾-in. tee, through the 1- by ¾-in. reducer and into the 1-in. ell is ⅛ in. in size and 7 in. long. This small pipe is screwed into the end of the close ⅜-in. nipple, which should be tapped for the purpose. The ⅜-in. nipple from the bushing connects to a check valve which is especially fitted for this purpose. The screw in the disk of a common check valve is loosened and a soft rubber seat is put under it. A hole is drilled in the top of the cap to admit a ¼-in. pipe, into which is screwed a ¼-in. nipple about 1 in. long. The nipple is capped, the cap is drilled out and tapped for ¼-in. 20-thread machine screw, on which is a check nut to hold the screw in position when it is once found. Below the screw and inside the nipple is a small disk nearly filling the hole, which forms a top bearing for the spring between the plunger of the valve and the screw in the cap. The spring is made from No. 18 brass wire. The tension on this spring is very slight, as the disk in the valve has sufficient weight to hold it almost close enough. Best results are obtained when the valve is set so as to allow a slight quantity of gas to flow into the combining tube when the engine is not running. This portion of the connections, comprised of the check valve, air valve and the small tube, constitutes the mixer or carbureter for gas. The engine drawing on the combining tube draws the right quantity of gas and air at the same time into the upright 1-in. nipple and it passes up through the inlet valve of the engine. This carbureter will not work satisfactorily without a gas bag or gasometer.

A gasometer used in connection with the above described carbureter can be made from cans, such as used for garbage. The gasometer as shown in the sketch was made of such cans, the outer one being about 2 or 2½ in. larger than the inner can and possibly 3 in. deeper. A brass fork was soldered on the bottom of the smaller can on the outside. This smaller can forms the bell of the gasometer. Two pieces of ⅜-in. galvanized pipe are soldered in the bottom of the larger can in the center, allowing

them to come to within 1 in. of the top of the can. These pipes on the outside of the can are connected with elbows and unions to place the gasometer in the gas pipe main. The brass fork fastened to the bottom of the small can, which is now the top of the bell, is connected by two levers to a straightway cock on the incoming gas pipe. Several holes are drilled in both levers for adjustment, so a pin can be placed in any position necessary to get the right flow of gas and also to shut off the cock when the gasometer is full of gas. Water is placed in the larger can to make the seal.

A Tool for Grinding Centers

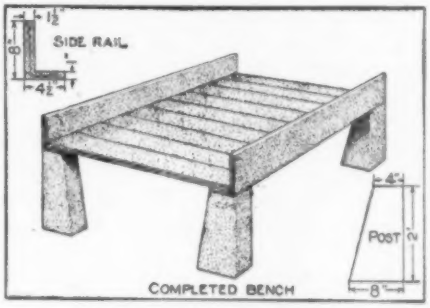
With the tool as shown in the sketch one man can, with very little skill, grind a lathe center perfectly true on a common emery wheel in less time than he can set up the ordinary grinding rig in his lathe, says a correspondent of American Machinist. Figure 1 shows how the center is held to the wheel when giving it the last finish. If the center is in bad shape, by lowering the left hand the operator can make the wheel cut very fast. Figure 2 shows the end view. It makes no difference how much the center is out of true, the high speed at which it will run forms a true center.



Grinding a Lathe Center

Concrete Benches for Greenhouses

The accompanying sketch shows the construction of parts to build a concrete bench for the greenhouse. The parts can be made in a metal or wooden mold and reinforced with expanded metal. The side rails are made in an



Made Entirely of Concrete

angle as shown and are about 6 ft. in length. The bottom pieces are 1 in. thick, 8 in. wide and in any length to suit the space. The posts are 2 ft. high and have one side perpendicular, and the other three sides inclined to make the top 4 in. square and the bottom 8 in. The straight side is placed toward the walk or wall, whichever it may be. A correspondent of Florists' Review says that the weight of the soil and plants holds the side rails so firmly that an ordinary man has not strength enough to pull one of the pieces out.

Preparing Ice Surface for Skating

When the weather gets colder than 10 to 15 deg. below zero the surface of the ice on a skating pond will become a little "chalky," as it is called, and also brittle under the skate runners, the skate having a tendency to cling to the ice. Persons owning a large enclosed skating rink in Alaska had this trouble and a remedy was suggested that when applied proved to be a great success. The remedy suggested was to have the surface of the ice atomized with a fine spray of kerosene oil. This lays a fine

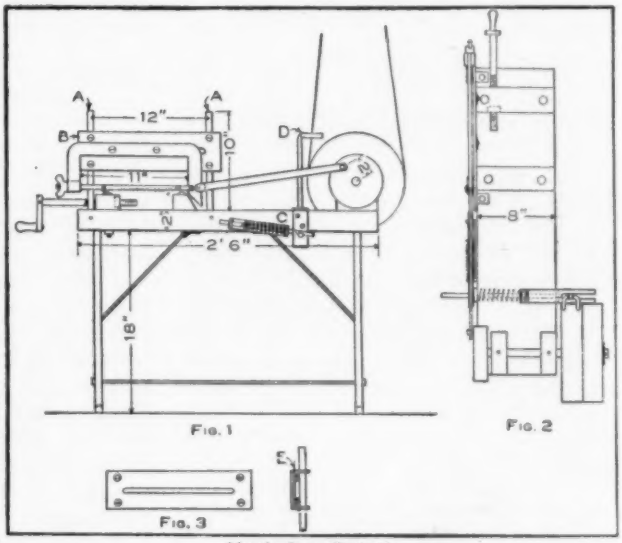
film of oil on the surface of the ice which kills all the chalky condition and allows the skate to glide over the surface without detecting any brittleness. —Contributed by Chester W. Tennant, Dawson, Y. T.

Inexpensive Home-Made Power Hack-Saw

The frame or legs of this machine were made from the lower part of an old gasoline stove on which a top was fitted by using a piece of plank 2 in. thick, 8 in. wide and 2½ ft. long. The standards, A A, Fig. 1, were made from ⅝-in. round iron and fastened in holes near the edge of the top. The plate B, Fig. 1, is made from 4-in. band iron with a slot cut in the center ½ in. wide and 12 in. long, as shown in Fig. 3. Two supports are made as shown at E, Fig. 3, to hold the plate B, Fig. 1, and a ⅝-in. hole is drilled in each arm of E, Fig. 3, to fit loosely over the standards A A, Fig. 1. The saw frame is made from ¼- by 1¼-in. iron—an eye being made in one end through which a ½-in. bolt passes to hold and tighten the saw blade.

The saw frame slides freely back and forth on the plate B, Fig. 1, and on two bearings made from ½-in. pipe cut a little longer than the plate B is thick. Two bolts run through the saw frame, through the pieces of pipe placed in the slot and through a washer and are held in place with nuts.

The clamp or vise to hold the stock is made from two pieces of wood, one fastened solid to the top of the frame and the other made adjustable the same as a jaw of a vise with a ⅝-in. bolt having a long thread and a crank on the outer end. When the material is cut off the saw frame drops down and strikes the latch, C, Fig. 1, which unlocks the belt shifter, D, and the spring shifts the belt over on the loose pulley. —Contributed by Frank W. Rumsey, New London, Ohio.



Hack-Saw Details

Some Things to Know About Mirrors

The following pointers on mirrors contain some valuable information and could be used to advantage if they were printed on a card and the card hung in the glass room, says Furniture Journal: Always unpack mirrors immediately on arrival. Allow wet and sweaty mirrors a chance to dry out thoroughly. If left damp they will spoil. Take hold of the mirrors by the edges and never allow the hands to come in contact with the silver backing. When carrying mirrors keep the face toward the body. Never handle a mirror with hands covered with glue, finishing materials, or any foreign matter. Keep all paints, oils and acid out of the glass room. Use a rag dampened in benzine, to remove any paint or shellac that has happened to get on the face side in the making of the mirror. Other oils are injurious and should not be used. When setting a mirror on the

floor set it with the face out so that nothing will come in contact with the backing.

Method of Lowering a Large Tank in a Hole

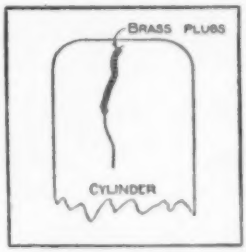
A large gasoline supply tank had to be installed for a manufacturing company and it was decided to bury the tank in the ground. The tank to be used was 12 ft. in diameter and 30 ft. long, built of boiler plate with manhole and pipe connections. The place selected for the tank was between a small stream and a building. The space was only 3 or 4 ft. wider than the diameter of the tank. The hole was dug 2 ft. wider than the diameter of the tank, the sides being planked up to prevent caving in. The hole was then pumped full of water from the stream and the tank rolled in. As the tank floated it was easily turned with the connections on top and held in this position while the water was pumped out of the hole, which lowered the tank to the bottom much quicker than rigging up tackle, which could not be used in this case on account of the limited space.—Contributed by W. E. Howe, N. Tarrytown, N. Y.

Etching Crystals on Glass

It is not generally known that most crystalline salts when allowed to crystallize on glass afford a sufficient resisting medium to allow of their beautiful form being etched into the glass by holding them in the vapor of hydrofluoric acid. The process is exceedingly simple, says The Master Painter. Having the glass surface covered with crystals, protect all but the part to be etched with a paper mask and expose the glass to the fumes of the acid. No artificial heat is required at ordinary temperature. About a minute will suffice for the etching, after which wash the glass promptly, and the forms of the crystals will be found permanently reproduced on the surface of the glass. Common salt is one of the best crystals to experiment with; it crystallizes very easily, and the forms it yields are varied. By reflected lamp light some of the etched crystals give a beautiful iridescence, due to interference.

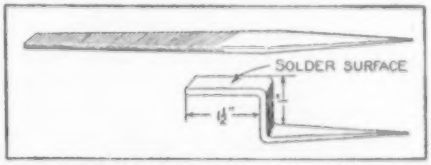
Repairing a Cracked Water Jacket

A very good way to repair a cracked water jacket on an automobile engine is to drill a ¼-in. hole at one end of the crack, tap the hole and fit in a brass plug. Fill the plug smooth with the surface and drill the next hole, cutting into this brass plug about half way. Tap and plug as before. Keep drilling holes and plugging in this manner until the crack is filled. Make the surface smooth and solder over the plugs to keep them in place.



Tool for Filing Inside of Tanks

A very handy tool for filing on the inside of boxes and tanks can be made by taking a piece of 3-16-in. soft iron and bending it, as shown in the cut, for a handle attachment. The handle is then fastened to a common file by placing solder on the surface of the iron shown and a slight heat will fasten the file and handle together.—Contributed by Thos. F. McBride, New York City.



Off-Set Handle for a File

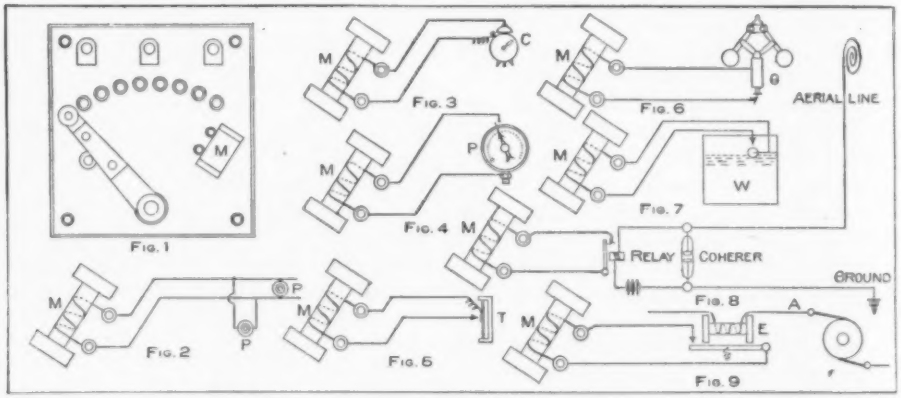
Stopping a Motor from a Distance

By Geo. W. Richardson

The control of electric motors at a distance is very desirable in some instances, and can be easily accomplished. The following description will make plain and deal with apparatus to stop motors only.

In Fig. 1 is shown the outlines of a starting box which is familiar to persons having anything to do with direct current motors that are started by hand, but as stated before, this subject deals with the stopping of motors, and for the sake of convenience we will call it a stopping box. Referring again to Fig. 1, you will notice at the right-hand side of the sketch a small electric magnet, M, with two terminals as shown. This magnet is used to hold the starting lever to the right while the motor is running, but should the circuit be opened for any reason, the magnet will lose its magnetism and the lever will fly to the left and remain so until moved again by hand to start the motor. If the lever will fly back to the left and stop the motor on account of the circuit opening, then the lever may also be made to fly to the left by simply short circuiting the terminals of the magnet with a piece of low resistance wire. This will cause the magnet to lose its magnetism for the time being, allowing the lever to fly back and stop the motor. Consequently if two wires are connected with the terminals of the magnet in the starting box of any direct current motor to any distance the motor may be stopped by many different appliances and for as many different purposes. Herein are given several diagrammatic sketches which will suggest themselves to be applied in the performance of many duties.

In Fig. 2 is shown the most simple method in which M represents the magnet and P the push buttons where as many buttons as necessary may be used, providing they are connected in multiple. The motor may be stopped at any time of the day or night by making connections from the magnet, M, Fig. 3, to an alarm clock, C. In this case the bell of the clock must be insulated from its support. Fig. 4 represents an ordinary pressure or vacuum gauge, P, which will stop the motor when the required pressure or vacuum is obtained. In Fig. 5 is shown the connections made to a thermostat, T, which will stop the motor at a certain set temperature. The method of stopping a motor from a governor, G, is shown in Fig. 6. The connections may be made to a float in a tank of water, W, Fig. 7, to stop the motor when the water

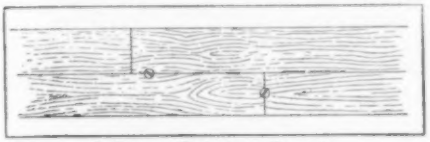


Different Connections to the Stopping Box

reaches a certain height. Fig. 8 shows a way to stop a motor by wireless waves as they are called. The motor may be wired as shown in Fig. 9 to stop itself when the load becomes too heavy. In E is shown an extra magnet placed in the armature circuit of the motor armature.

How to Keep Floors from Squeaking

The noise in floors that squeak in various places when stepped upon is



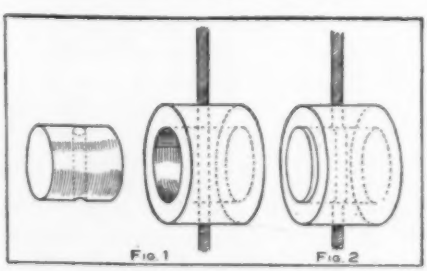
A Screw Between Boards

caused by the boards rubbing together. A good remedy is to turn in screws through the cracks, as shown in the sketch. This can be done at house-cleaning time. The screws will either spread or hold both boards together so they will not squeak.—Jas. G. Evans, Brooklyn.

Heads for the Ends of Cables

An exceedingly useful device used for the purpose of providing a head for wire cables is shown in the illustration. The device is quickly applied and dispenses with the soldering process. An outer sleeve with a solid center plug, Fig. 1, forms the parts for this device. A hole is drilled through both pieces. The plug is placed in the sleeve and the cable run through the hole. The plug is then driven so that the cable is pinched at the two points where it passes from sleeve to plug, as shown in Fig. 2. The end of the plug is then riveted over and the grip with which the device holds is astonishing. The ends of the cable may be cut and filed off smooth, giving it a neat appearance.

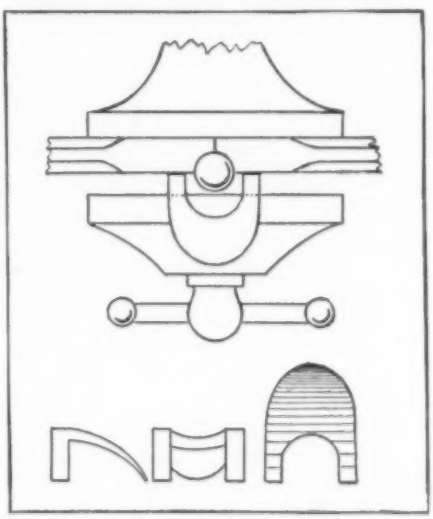
Instead of riveting over the end of the plug, a nut may be used for drawing the plug through and pinching the wire cable. With links on each side a most useful coupling for securing the ends of cables to levers and pedals is provided.



Cable Heads

Vise Attachment for the Buggy Shop

The accompanying sketch shows a very handy device for the finisher's bench. The attachment is useful for

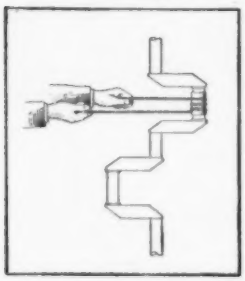


Plan View of Vise

holding top joints when filing them, says American Blacksmith. The device is made from ⅝-in. square machine steel. First rough out the ends of the piece with a fuller. Then bend the fullered ends down and bend the whole piece in a half circle. Forge out the center part and bend slightly to the shape of the jaw on a vise. This device prevents the buggy top joint from bending or doubling up in the vise.

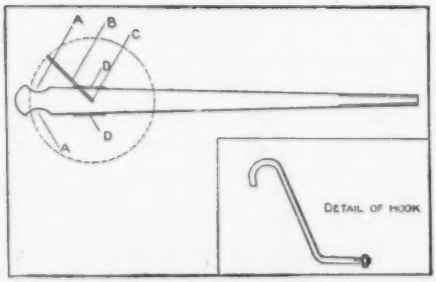
How to Polish a Crankshaft Bearing

Take a piece of emery cloth as wide as the bearing surface and wrap the cloth once around the bearing. Secure a piece of cord and wrap it twice around the emery cloth and then pull first one, then the other end of the rope in the manner of a see saw. Very fine emery cloth should be used.—Contributed by H. E. Eckles, Elyria, O.



Lever for Putting on Belts

A great many times belts must be put on pulleys when there is no power for assistance. A number of men will pull on spokes of wheels along the line of shafting to turn the belt on the pulley. As this method is not an easy or good way to put on the belt, a lever was devised by the use of which one man can do the work with ease. The lever is wood and about 9 ft. long, tapering at one end for a handle, rounded and two segments cut out, AA in sketch, at the other end. A hook, B, is fastened so it will swing freely at C, about 2 ft. from the end of the lever. Two iron plates, DD, are fastened to the edges of the lever for reinforcing the hole in

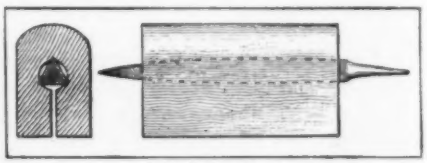


Lever for Turning a Wheel

which the hook is pivoted. When putting a belt on a pulley tie the belt to the face of the pulley with a rope and place the hook of the lever on a spoke in any wheel on the shafting, bringing one of the cutouts, A or A, under the shaft. The shaft can easily be turned with the lever and the belt run on the face of the pulley.

Jointing Tool for Saws

A very good device is made by taking a block, say 1½ in. thick, 2¼ in. wide and about 4 in. long, and boring a hole lengthwise through it, the hole to be a little smaller than the face of a three-cornered file. Drive a file into the hole, then from the bottom of the block cut a saw kerf square with the face of the file at its center. This makes a good gauge for jointing, says Blacksmith and Wheelwright. A flat file can be used in the block instead of a three-cornered one. A round piece,

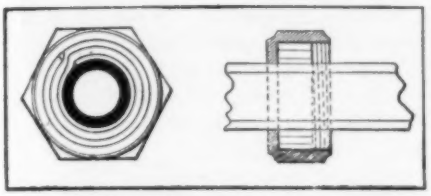


File in a Block

as for instance a large chisel handle or a door stop, could be used instead of the block and treated in the same manner. In jointing take off the smallest amount possible, making all the teeth the same length as the shortest one. The line of the points of the teeth should be left in a slight curve from the heel to the toe, or be "crowned" as it is sometimes called.

Gauge Glass Packing

When there is no special packing on hand for gauge glasses, or if it is desired to find a use for scraps of sheet rubber packing, which would otherwise be thrown away, the following may serve your turn: Cut the sheet rubber scraps into long pieces, of a width slightly less than the depth of the gland or nut, and wrap the rubber around the glass once or twice, or as many



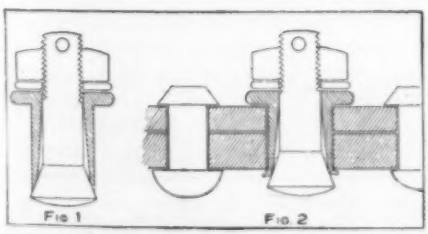
Scrap Rubber Packing

times as the thickness of the rubber will permit, as shown in the accompanying sketch. Cut the loose end even to match the end in the gland, says a correspondent of Power.

The same method may be employed to advantage in packing valve stems. The sheet rubber should not be too hard, but moderately elastic.

An Emergency Expansion Rivet

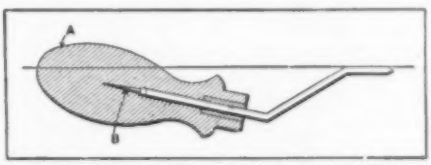
Broken rivets in boilers or ship bottoms cause considerable trouble from leaking, and the leakage cannot be stopped until another rivet is put in the hole. The accompanying sketch shows an expansion rivet or bolt for use in such places as an immediate and permanent repair. The bolt is made with a conical head and has a shell covering of copper or lead as shown in Fig. 1. The outside diameter of the shell is made to just fit in the rivet holes. The bolt with the shell can be inserted and set in place from one side of the metal plate. The bolt and shell are pushed through the rivet hole head first and the nut drawn up by holding the bolt with a pin passed through the hole in the end of the bolt. The conical head of the bolt turns the end of the shell over, which makes a perfectly tight joint. When set in place the bolt cannot come out and a permanent repair is obtained.—Contributed by Robert Crump, Brooklyn, N. Y.



Repairing with an Expansion Rivet

A Handy Screwdriver

A small tool that is handier than the ordinary screwdriver, particularly for putting in small long screws, was made by a contributor to Wood Craft. The tool consists of a handle, A, in which is drilled a hole, so a wire, say 3 in. long, will revolve in it without much friction. Into the bottom of the hole is driven a small brad, B, which is used as a bearing for the end of the rod constituting the screwdriver proper. The outer end is flattened to suitable dimensions. It will be seen that the tool constitutes a very neat little screwdriver, which will sink small screws very rapidly by simply revolving the handle like a crank, in the proper direction. A number of wires with different sized ends can be kept on hand, and exchanged as conditions require.



Crank Handle for Screwdriver

Quickly Made Pipe Repairs

Some years ago I found it necessary to repair the 1-in. pipe that supplied my residence with water from a spring on a hill above the house, says a correspondent of Wood-Worker. I found a hole about $\frac{3}{8}$-in. in diameter through the iron. Not wanting to dig up the pipe I purchased from a carriage maker for 5 cents an axle clip and yoke, bent it around the pipe over the hole, put on the yoke, put a piece of rubber packing about 1 in. square between the clip and the pipe over the hole, screwed the clip up tight and the leak was stopped. When taking up the pipe several years after it was found

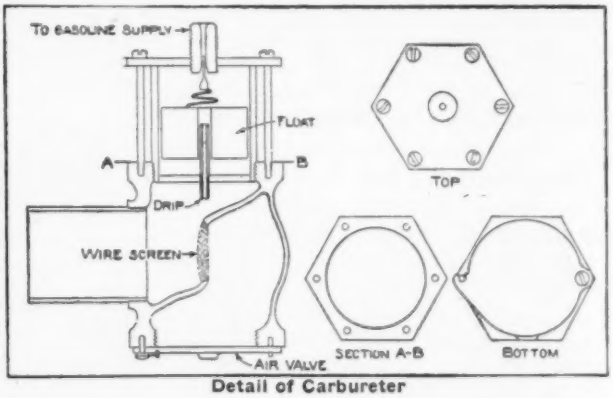
that the repair was as good as when put on, except that the clip had rusted a little.

How to Make a Carbureter

Recently I owned an engine of the four-cycle marine type which in some way lost its carbureter while standing under a shed in my back yard over night. As it was impossible to purchase another in Manila I decided to try making one. An old check valve of the horizontal type was found in the scrap and I removed the valve cap and valve. I secured a brass nipple about 2 in. long and turned a thread on one end, and this was screwed in the place where the cap had been which made the neck that the carbureter has for connections to the engine. Two layers of bronze wire screen, about 30 mesh, were soldered across the opening of the valve seat. A float chamber was made from a piece of 2-in. copper pipe 3 in. long, which was fitted with a bottom made from $\frac{3}{16}$-in. brass plate to which I soldered a small nut in the center. Through this nut was fitted a small brass pipe a little less than 2 in. long for the drip. The piece of 3-in. copper pipe was threaded to fit one end of the valve threads. After turning the pipe in place, as shown, the threads were soldered to make a tight joint. The cover or top can be made from a piece of brass cut to the same shape and size as the valve end. Holes were drilled through the six corners of this top. Also corresponding holes were drilled and tapped in the end of the valve. Six long screws were placed in these holes and drawn up tight to hold the top in position.

The center of the top was fitted with a piece of brass rod on which $\frac{1}{4}$-in. pipe threads were cut and the top tapped with a $\frac{1}{4}$-in. pipe tap. About $\frac{1}{2}$ in. of this rod should extend above the top. A small hole was bored through the rod about the size of a bicycle spoke. The hole should be taper bored so as to form a valve seat.

The float is a very light copper cylinder with an opening through the center. The opening in the center was made by soldering in a small copper pipe of such a size as to freely slip over the drip pipe. A valve was attached to the top of the float with a spiral spring, as shown, to shut off the gasoline when the proper level is obtained.



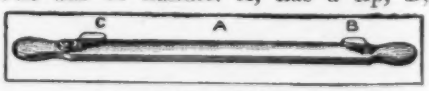
Detail of Carbureter

This valve and spring can be made from an old bicycle spoke and nipple. The drip pipe should extend up into the float chamber at least $1\frac{1}{2}$ in., which height depends somewhat on the weight of the float.

The air valve was made from a piece of $\frac{1}{16}$-in. brass cut as shown and fitted to the bottom.—Contributed by Wm. C. Younger, Cebu, P. I.

How to Make a Rasp Handle

The accompanying sketch shows how to make a small handle for holding a rasp. This handle can be made to hold a 14- or 16-in. rasp, says a correspondent of Blacksmith and Wheelwright. The bar or handle, A, has a lip, B,

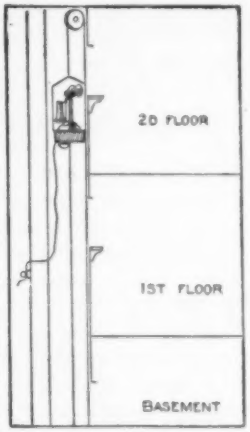


Rasp Holder

welded on one end and the same kind of a lip, C, bolted to the other end. The rasp is slipped under the lips and when the bolted lip is tightened the rasp is held firmly in place.

One Telephone Used on Several Floors

In places where there is more than one floor to buildings and only a few workmen, several telephones are not necessary for the different floors. The accompanying sketch shows a device by which one telephone will answer the purpose for all floors. The device is similar to that of a dumb waiter on which the telephone and magneto are attached. The telephone can then be drawn to the floor on which the workman may be with an endless rope running over sheaves on the top floor and in the basement.



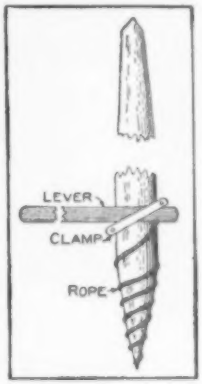
Draining Gas Engine Exhaust Pipes

Gas engine exhaust pipes that are necessarily long should have a hole drilled in a fitting that is the lowest in the line. This will prevent any accumulation of water caused by condensation in the pipes and avoid stopping the engine on account of back pressure in the exhaust.

A disinfectant that is most effective in moldy cellars, kitchen sinks or bad-smelling places of all kinds, and which will drive away fleas and flies, can be made for fifteen cents. All that is needed is to dissolve a pound of copperas in a gallon of water and add 8 oz. of carbolic acid.

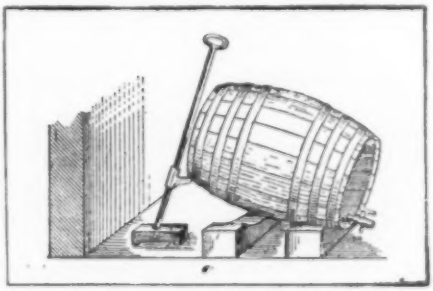
Setting Telephone Poles in Soft Ground

Telephone poles may be set in soft ground, where it is impossible to dig a hole, by the method shown in the sketch. The bottom end of the pole is pointed for a length of about 20 in. An old piece of 1-in. rope, or, better still, a piece of 1-in. telephone cable, is nailed on the sloping part in the form of a spiral beginning with the end of the rope at the point of the pole. Keep the coils about 1½ in. apart all the way up. The rope may be wound to make either a right- or left-handed turn. A long lever is clamped to the pole at a convenient height for use in turning the pole into the soft ground. A pole set in this manner will be more rigid than if set in a dug hole.



Removing Entire Contents from a Barrel

The accompanying sketch shows a method of tipping a barrel so as to remove all the contents contained therein. The device consists of a rod having a socket bearing in a block at the lower and a handle at the upper end. This rod is threaded for the greater portion of its length and then fitted

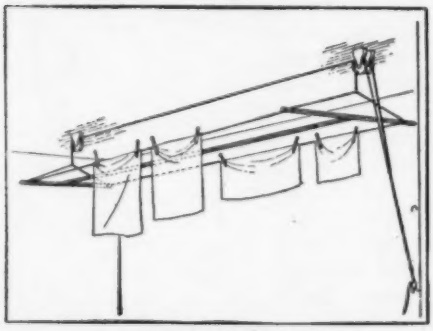


Tipping the Barrel

with a small lug having a projection to catch into the barrel. When the barrel becomes nearly empty the device is adjusted under the back end and with a few turns of the handle the barrel is tipped in such a position that all the contents can be drained out.

Interior Clothes Line

The clothes line or hanger as illustrated herewith is intended for use in the house during wet or cloudy weather. The frame is made with a center piece



Overhead Clothes Line

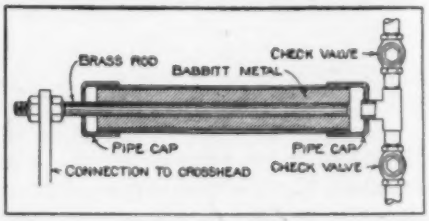
of round wood about 1 in. in diameter and any length to suit the size of the room. The wood may be square, if a round piece cannot be secured. The two end pieces are of the same material and 18 in. long. The pieces are held together at the connections with small braces made from iron. The frame is hung to the ceiling on three ½-in. brass screw pulleys. Clothes lines are stretched between the end pieces on which to hang the clothes.

Overcooling Automobile Engines in Winter

An automobile radiator and fan designed to give the best temperature in summer will cool the engine too much in winter, says Motor Age. If the automobile is used in very cold weather it may be quite feasible to remove the fan belt altogether without producing overheating. If this is found impracticable, a sheet of tin may be made to the outline of the upper portion of the radiator and wired to the back of the radiator to cut off a portion of the fan draft. The size of this sheet will be a matter for experiment. The wires which hold it should pass through the air space of the radiator and over small wood, fibre or rubber protectors to prevent chafing the front edges of the radiator tubes. The radiator in normal usage should be hotter than the hand can comfortably bear. In summer weather it is frequently wise to stop the water circulating through the carbureter waterjacket.

Home-Made Crosshead Pump

A good crosshead pump can be made from articles usually found in the scrap box of an engine room. The cylinder can be made from a piece of large steam pipe cut to the proper length for the stroke and fitted with threads on each end. A brass rod can be used for the piston, which is placed exactly in the center of the pipe and babbitt metal melted and poured in around it. Common pipe caps are fitted to the ends of the pipe. The cap on the end where the piston is connected to the crosshead is drilled to fit the piston a little loose and used for a packing nut. The other cap is drilled and tapped to fit the connections in the



Pump Connections

water line. Two check valves placed in this line completes the pump. As no sizes are given in this description the pump must be made in size to meet the requirements of the engine.—Contributed by Guy W. Cole, Alexis, Ill.

When water is frozen solid it expands about one-tenth its bulk.

Amateur Mechanics

Revolving a Wheel with Boat Sails

A novel windmill or revolving wheel can be made by placing a light wheel so it will turn freely on the end of a post, and placing four small sailing boats at equal points on the rim of the wheel. It makes no difference which way the wind blows the wheel will revolve in one direction. In Fig. 1 the direction of the wind is shown by the arrows, and how the sails catch the wind and cause the wheel to revolve. Fig. 2 shows how the wheel will appear when complete. This device makes an attractive advertising sign.

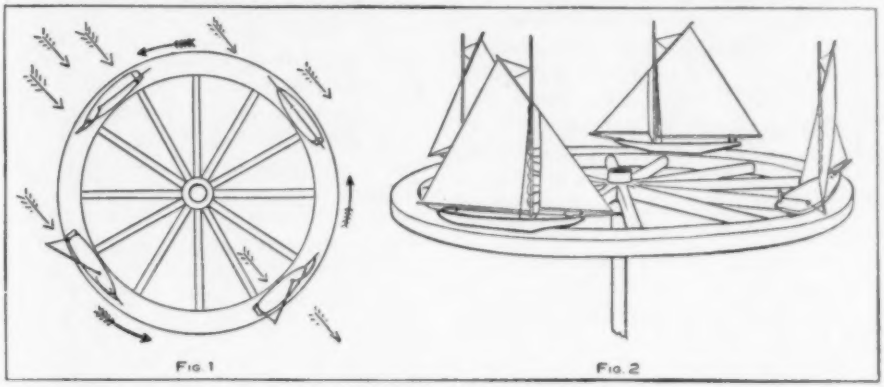
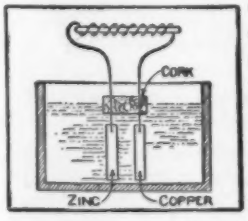


FIG. 1 FIG. 2

An Unusual Type of Windmill

A Floating Electro-Magnet

A piece of iron placed in a coil of wire carrying a current of electricity becomes an electro-magnet. If such a coil and iron core be made small enough they can be attached to a cork and the cork floating on a solution will allow the magnet to point north and south. The sketch shows how to make such an instrument. A coil of insulated wire is wrapped around a small iron core, leaving a few inches of each end free for connections. The insulation is removed from these ends and they are run through a piece of cork. Attach to the wires on the under side of the cork, a piece of zinc to one of the ends and a piece of copper to the other end. The cork is then floated on a solution of acid, with the zinc and copper hanging in the solution. If zinc and copper are used the solution is made from water and blue vitriol. If zinc and carbon are used, then the solution is made from sal ammoniac and water.

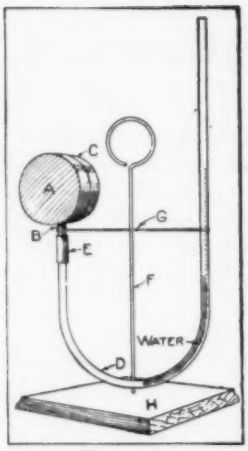


The float will move about on the solution until the magnet iron will point north and south. If two of them are floating on the same solution they will move about and finally arrange themselves end to end with the coils and magnet cores pointing north and south.—Contributed by C. Lloyd Enos.

Home-Made Air Thermometer

The illustration shows the complete thermometer. The water in the glass tube is caused to rise and fall by the expansion and contraction of the air in the tin box.

A paper fastener box about 1¼ in.



Air Thermometer

deep and 2 in. in diameter will serve very well for the box A. Solder in the side of the box a 1-in. piece of ¼-in. brass tubing, B, and then solder on the cover, C, so that the only escape for the air is through the brass tube. Secure a piece of ¼-in. glass tubing—not shorter than 18 in.—and bend it as shown at D in the sketch. Hold the part of the tube to be bent in the broad side of a gas jet, and in a minute or two the tube will bend with its own weight. Any angle can be given glass tubing in this way. Connect the glass tube to B with a short piece of rubber hose, E. If the hose is not a tight fit, bind with a short piece of fine copper wire. The standard, F, is made from a piece of No. 10 wire about 10 in. long. To this standard solder the supporting wire, G—No. 14 wire will do. On one side bend the wire around the tube B, and on the other around the glass tube, D.

The base, H, can be made of oak, stained and varnished. The bottom of the box, A, is covered with lampblack so as to readily absorb all heat that strikes the surface. The black should not be put on until just before you paint the supports, cover and rim of the box with gold or silver paint. Hold the bottom of the box to be blackened over a little burning cotton saturated with turpentine.

The scale on the glass can be etched with hydrofluoric acid, or made with a little black paint. The water can be put in with a medicine dropper. This instrument will measure the amount of heat given by a candle some 20 or 30 ft. away.—Contributed by J. Thos. Rhamstine.

Home-Made Battery Voltmeter

Secure a piece of brass tube 3 in. long that has about ¼-in. hole. Put ends, A, 1¼ in. square and cut from heavy cardboard on this tube. Make a hole in the center of each cardboard just large enough to allow the brass tube to fit tight. Put on two or three layers of stout paper around the brass tube and between the cardboard ends. Wind evenly about 2 oz. of No. 26 cotton-covered magnet wire on the paper between the ends and leave about 2 in. of wire on each end extending from the coil. Use a board ½ in. thick, 3 in. wide and 6 in. long for the base and fasten the coil to it, as shown in Fig. 1. Bore holes for binding-posts, B, one on each side of the board, and connect the two wires from the coil to them. At the other end of the board and in the center drive a wire nail and attach a small spring, C, to it. The spring should be about 1 in. long. Take a small piece of soft iron, D, ½ in. long and just large enough to slip freely through the brass

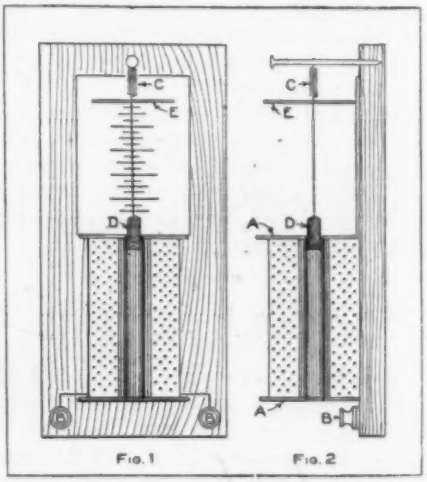


Fig. 1 Fig. 2

Battery Voltmeter Construction

tube and solder a piece of copper wire to it; the other end of the copper wire being hooked to the spring, C. The copper wire must be just long enough to allow the piece of iron, D, to hang part way in the end of the coil and still

hold the spring in place. A circular piece of cardboard, E, is slipped over the spring to where the spring joins the wire. This cardboard is to serve as the pointer. A piece of paper 1½ in. wide and 2½ in. long is glued to the board so that it will be directly under the cardboard pointer and fit snugly up against the top of the coil.

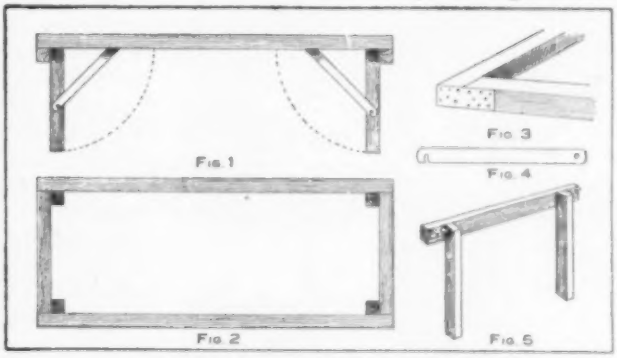
The paper can be calibrated by connecting one cell of battery to the binding-posts. The iron plunger, D, is drawn into the tube and consequently the pointer, E, is drawn nearer to the coil. Make a mark directly under the place where the pointer comes to rest. At the place mark the number of volts the cell reads when connected with a voltmeter. Do the same with two or three cells and mark down the result on the scale. By dividing off the space between these marks you may be able to obtain a surprisingly correct reading when connected with the battery cells to be tested.—Contributed by Edward M. Teasdale, Cuba, N. Y.

How to Make a Folding Canvas Cot

All the material required to make the cot as shown in Fig. 1 consists of wood 1½ in. square of which two pieces are 6 ft. long; two pieces 2 ft. 3 in. long; two pieces 2½ ft. long; four pieces 1½ ft. long; four hinges; some sheet metal and 2¼ yd. of 8-oz. canvas.

Make a rectangle of the two long pieces and the two 2-ft. 3-in. pieces of wood as shown in Fig. 2, nailing well the corners together and reinforcing with a strip of sheet metal as shown in Fig. 3. The four pieces 1½ ft. long are used for the legs, and two of them are nailed to one of the pieces 2½ ft. long, making a support as shown in Fig. 5.

Make two of these—one for each end. The hinges are attached as shown in Fig. 5 and the whole support is fastened just under the end pieces of the frame by hinges. Four pieces of sheet metal are cut as shown in Fig. 4 and fastened to the body of the frame with their lower ends hooking over pins driven in each leg at the proper place. The canvas is stretched as tight as possible over the two long side pieces and fastened on the outside edge of each piece with large headed tacks. The legs will fold up as shown by the dotted line and the cot can be stored in a small space.—Contributed by R. J. Smith, Milwaukee, Wis.



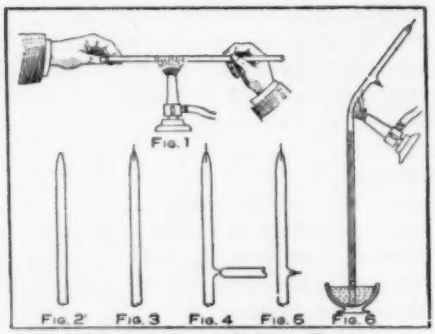
Details of Canvas Cot Construction

How to Make a Small Geissler Tube

At first this would seem to be a difficult piece of work, yet a good and beautiful Geissler tube can be made at home in the following manner:

Procure a glass tube about 3½ ft. long having a hole through its center about ⅛ or ¼ in. in diameter, about 1 in. of No. 30 platinum wire and enough mercury to fill the tube and a small bowl. About 1½ lb. of mercury will be sufficient. The first thing to do is to seal ½ in. of platinum wire in one end of the tube. This is done by holding the end of the tube with the right hand and taking hold of the tube with the left hand about 4 in. from the right hand. Hold the tube in a flame of a bunsen burner in such manner that the flame

will strike the tube midway between the hands, as shown in Fig. 1, and keep turning the tube so as to get an even heat. When the glass becomes soft, re-



Construction of Geissler Tube

move the tube from the flame and quickly draw it out into a fine thread. Break this thread off about $\frac{1}{8}$ in. from the long part of the tube and the end will appear as shown in Fig. 2. Take $\frac{1}{2}$ in. of the platinum wire and slip it through the fine hole made by breaking the glass thread so that one-half of the wire will be inside of the long tube. If the end of the tube is now placed in the flame of the burner, the glass will adhere to the platinum wire and the wire will thus be sealed in the tube. The finished end will appear as shown in Fig. 3. This tube as described will be 8 in. long, although nearly any size could be made in the same way.

Measure 8 in. from the sealed end and place the tube at that point in the flame, holding in the left hand. At the same time take the piece of glass that was broken off at the end in the first operation and hold it in the flame with the right hand. When both the tube and piece of glass are soft, touch the soft part of the tube with the end of the glass and draw the tube out into a point like that shown in Fig. 4. Break off the piece of glass, thus leaving a small aperture in the long tube. Seal the remaining $\frac{1}{2}$ in. of platinum in this aperture in the same manner as before, being careful not to heat the tube too suddenly. The tube is now ready for filling and the upper part will appear as shown in Fig. 5.

The air is expelled from the tube by filling with mercury. This may be done by making a paper funnel and pouring the mercury slowly into the tube through the funnel. When the tube is filled to within $\frac{1}{2}$ in. of the funnel remove the funnel and tap the side of the tube gently in order to remove any small air bubbles that may be clinging to the sides of the tube. The air bubbles will rise and come to the top. The tube now must be filled completely, expelling all the air. Place a finger over the end of the tube to keep the mercury in and invert the tube and set the end in the bowl of mercury. The mercury in the tube will sink until the level will be at about 30 in., leaving 8 in. of vacuum at the top. The next operation is to seal the tube at the half-way point between the lower platinum wire and the mercury level.

As the lower end of the tube must be kept at all times in the bowl of mercury until the tube is sealed, an assistant will be necessary for this last operation. Have the assistant hold the tube in the mercury at a slight angle, using care to always keep the lower end in the mercury, while you hold the burner in the left hand and allow the flame to strike the tube at the stated point. The part of the tube above this point will gradually bend over of its own weight as the glass softens. When it reaches the angle of about 60 deg., Fig. 6, take hold of the tube with the right hand, still keeping the flame on the tube, and gradually draw the softened portion out until it separates from the main tube.

The tube is now finished and when the platinum wires are attached to the terminals of a spark coil a beautiful blue light will appear in the tube with a dark space at the negative end or cathode.—Contributed by David A. Keys, Toronto, Can.

Nuts that are rusted fast can often be loosened by giving a hard turn in the tightening direction.

Greasy stoves may be cleaned with a strong solution of lye or soda.

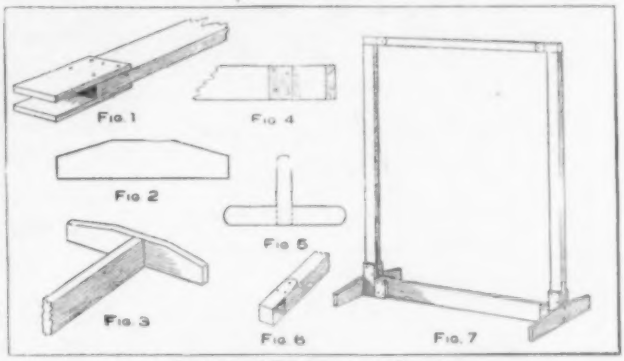
How to Make a Take-Down Background Frame

Many amateur photographers who desire to do portrait work at home have left the subject alone for the want of a suitable background. A frame such as is used by the professional is entirely out of the question in most homes, says a correspondent of Camera Craft. The frame as shown in the sketch was devised and its chief advantage lies in the fact that when not in use it can be compactly tied together and stored away in a closet.

Almost any wood may be used in constructing this frame, but yellow pine is the best, as it is easily obtained and at the same time very well suited for such work. All pieces are to be dressed on all sides.

Two upright pieces are cut from ¾-in. material 2 in. wide and 5 ft. 9 in. long and two blocks are fastened on the ends of each that are to be used for the bottom, as shown in Fig. 1. These blocks are each 2 by 6 in. and ¼ in. thick. The base is made from a piece ¾ in. thick, 3 in. wide and 5 ft. 4 in. long. A crosspiece ¾ in. thick, 3 in. wide and 12 in. long, cut in the shape shown in Fig. 2, is screwed on each end of the base with 3-in. wood screws, as shown in Fig. 3. Four blocks ¼ in. thick, 1 in. wide and 3 in. long are nailed to the sides of the base piece parallel with and at a distance of 2 in. from the end of same. This forms a slot, Fig. 4, to receive the pieces nailed to the ends of the uprights. To secure a rigid frame it is essential that this joint be accurately put together.

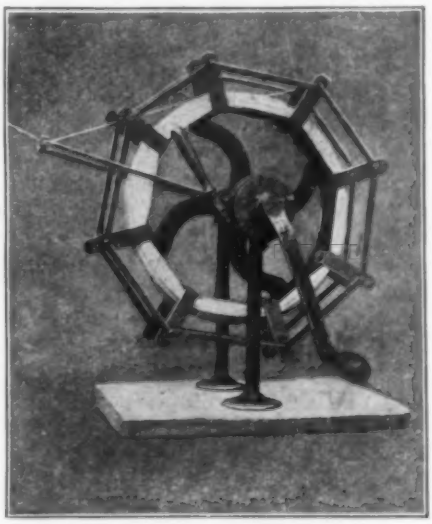
Procure a piece of thick tin or brass and make two pieces like the pattern shown in Fig. 5, with each projection 3 in. long. The width of the crosspiece is 1 in. and the single projection ¾ in. These are bent and nailed, one on each end of a piece of wood that is ¼ in. thick, 1 in. wide and 5 ft. long, as in Fig. 6. These will form two pockets that will fit over the tops of the uprights. The frame is put together as shown in Fig. 7. Any background that will hang straight without need of being stretched can be hung on this frame.



Details of Background Frame

Home-Made Kite Reel

This kite reel is constructed from two old pulleys and a few pipe fittings. The large pulley is about 14 in. in diameter, on the face of which are riveted flat strips of iron with extending arms. These arms are reinforced by riveting smaller pieces from one to the

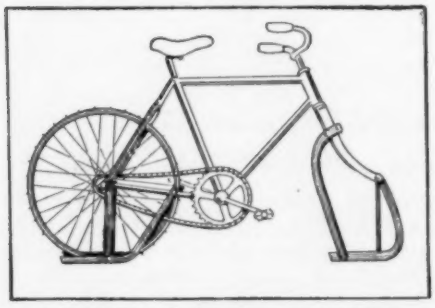


Old Pulleys and Pipe Fittings

other, which connects all arms together on both sides of the wheel. Mounted on the shaft with the pulleys is a guide for the kite wire or string. The photograph shows that this guide permits of being moved entirely over the top of the reel. The smaller pulley is attached to the shaft and used as a brake. The brake is used only when running out the wire or string, first removing the crank.

Attaching Runners to a Bicycle for Winter Use

Instead of storing away your bicycle



Bicycle Fitted with Runners for Snow

for the winter, attach runners and use it on the ice. The runners can be made from ¼-in. by 1-in. iron and fastened to the bicycle frame as shown in the sketch. The tire is removed from the rim of the rear wheel and large screws turned into the rim, leaving the greater part of the screw extending. Cut off the heads of the screws and file them to a point. The rear runners should be set so the rim of the wheel will be about ½ in. above the runner level.—Contributed by C. R. Welsh, Manhattan, Kan.

A Paper That Makes Green Prints

A coating for ordinary paper that is said to give green prints is made with a two per cent solution of gelatine, says Photography, and sensitized with the following solution:

Potassium Bichromate	15 gr.
Magnesium Sulphate	25 gr.
Water	1 oz.

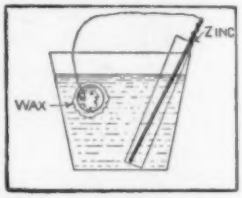
This mixture is spread over the paper in the usual way and the paper dried in the dark. Printing is carried rather far. The print is washed, then surface dried or blotted off on a pad and laid film upwards on a sheet of glass, and the following developer is applied with a wad of cotton wool wrung out:

Pyrocatechin	5 gr.
Water	1 oz.

The picture assumes a rich green color when developed, and is then washed for five or ten minutes and dried quickly by heat.

Copies Made from Wax Molds by Electro-Deposition

Fine copies of wax impressions can be made in the following manner: Procure an ordinary tumbler and fill it with a strong solution of sulphate of copper, which is made by dissolving two cents' worth of blue vitriol in ½ pt. of water. After this is done make a porous cell by rolling a piece of brown paper around a stick and fastening the edge with sealing wax; also, fix a bottom to the cell in the same way. Make a solution of one part of oil of vitriol and 5 parts of water and pour this mixture into the porous cell. Wind the end of a copper wire around the end of a piece of zinc and place the zinc in the porous cell. Attach the other end of the wire to the wax impression.



The wax impression is made by pouring melted beeswax on the article you wish to reproduce and removing after the wax gets cold. The wax mold then should be coated with black lead and polished. This is done with a camel's hair brush. A fine copy can be made on the wax impression after the battery has been running about 12 hr.—Contributed by Edward M. Teasdale.

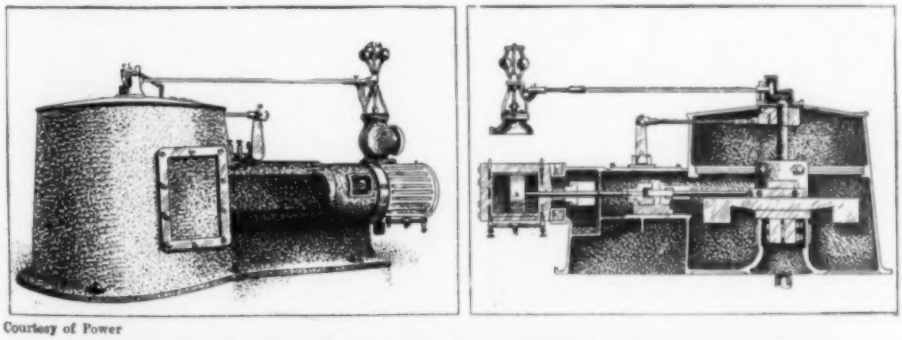
HORIZONTAL ENGINE WITH VERTICAL SHAFT

A horizontal engine with a vertical shaft is being manufactured by a Pennsylvania company to meet the increasing demand for a power to act directly on a vertical shafting. It is an interesting departure from the general form and design of reciprocating engines and is well adapted to driving vertical, centrifugal and turbine pumps as auxiliaries to condensing plants.

The arrangement of the engine admits of direct connection by extending the crankshaft to any distance above or below. The fly-wheel or balance wheel is mounted upon a pedestal base in the center of the crank case, and the moving element rotates upon a thrust ball and roller bearing. The valve gear is driven from an ordinary eccentric upon the upper end of the crankshaft, and the motion of the eccentric is at an angle of 45 degrees with the plane of the valve travel. To transfer the motion from the eccentric to the valve as required a universal joint is placed on each end of the valve-eccentric rod. The crosshead is provided with three guides and shoes, the two side guides being the regular working guides, while the bottom one carries the weight of the crosshead and preserves the proper alignment of the engine. The crank case is inclosed, and presents a neat, compact appearance. It also acts as a reservoir for the oil used, which is circulated continuously over the bearings by a small pump. A rather ingenious plan is adopted to prevent the oil from following the shaft below the engine. There is an opening in the bottom of the base upon which the balance wheel rests. An oil collar, which is rigidly attached to the shaft, revolves in this space, and the rim of this collar is drawn out to a thin edge, so that centrifugal force throws the oil off into a circular cavity provided to receive it.

TRANSPORTING ELEPHANTS IN INDIA

Although elephant trains in India are not nearly as frequent as cattle trains in the United States, especially in the vicinity of Chicago, they are not an unfamiliar sight to the natives.



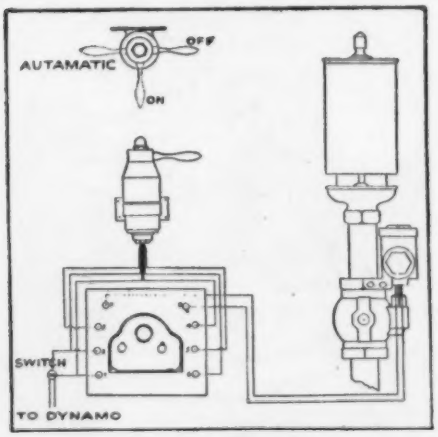
Courtesy of Power

Meets Increasing Demand for Power to Act Directly on a Vertical Shafting

This train of elephants is on the Madras railway, in the southern part of India. Each car carries two elephants.

AN AUTOMATIC ELECTRIC WHISTLE OPERATOR

The accompanying drawing shows an ingenious automatic electric whistle-operator for use on steamships. It consists of an electrically controlled whistle valve and magnet, weighing about 50 lb. and measuring a foot in



For Use on Steamships

height, the valves being operated by means of a direct current from the ship's dynamo.

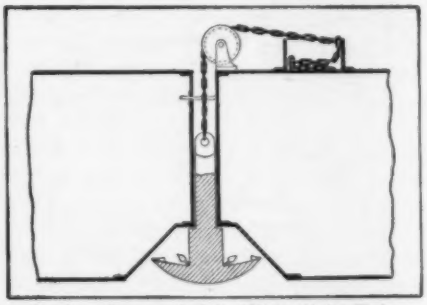
The operating case, which contains a clock, is set up in the pilot-house. By making the steam and electrical connections the system is ready for use, and by setting the clock for the required time and throwing the operating switch to the point marked "automatic," one blast will follow another at exact intervals. The clock can be set to operate the whistle at regular intervals ranging from every half minute to every half hour. In a heavy fog or under other conditions where whistling at stated intervals is required by law, such an arrangement relieves the ship's officers from much trouble.

For ordinary signaling, the lever on the operating switch is thrown to a point marked "on." The operating case is also fitted with a telegraph key, so that the Morse or any similar telegraph code can be sounded for communication with other vessels.

AN ANCHOR FOR SUBMARINE VESSELS

A French engineer has recently had patented in the United States an anchor for submarine boats. The invention consists essentially in providing within the boat a vertical tube of suitable form and dimensions through which the anchor chain passes and in which the anchor is accommodated in its raised position.

As shown in the illustration, the anchor, the flukes of which are rather short, is suspended in a water-tight tube extending through the hull of the vessel and terminating below in a cavity. The purpose of the cavity is to keep the anchor from offering resistance to the travel of the vessel.



Anchor Suspended in Watertight Tube

The weighing or casting of the anchor does not necessitate the opening of the hull, and in no way modifies the stability and conditions of the weight of the vessel.

A report from the Department of Commerce and Labor estimates that between now and the completion of the Panama Canal more than $60,000,000 will have to be spent in harbor improvements on the west coast in order that the ports may obtain the fullest advantages of the canal. The greatest harbor improvement is that of Valparaiso, which will involve the ultimate expenditure of $20,000,000.